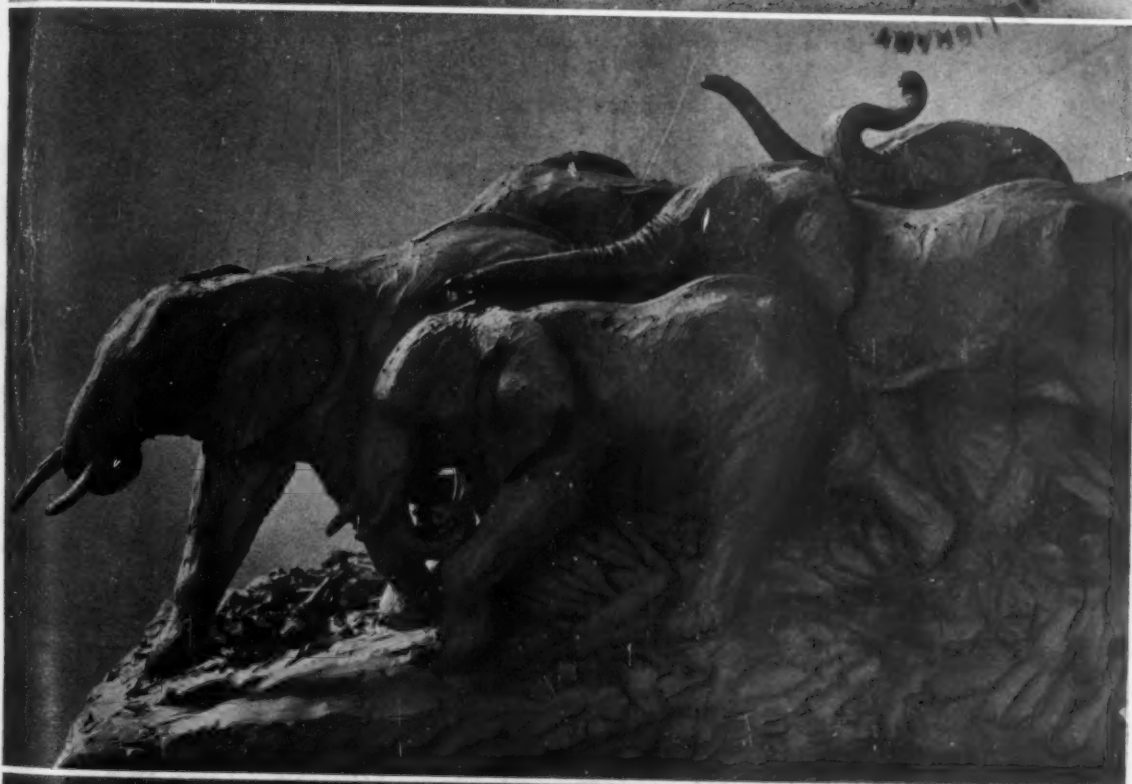


THE AMERICAN MUSEUM JOURNAL

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AMERICAN MUSEUM OF NATURAL HISTORY



THE NEW AFRICAN HALL PLANNED
BY CARL E. CLARKE

WHICH SETS A NEW STANDARD IN
MUSEUM EXHIBITION IS DESCRIBED
AND FIGURED IN THIS ISSUE

American Museum of Natural History

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The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people, and it is in cordial coöperation with all similar institutions throughout the world. The Museum authorities are dependent upon private subscriptions and the dues from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

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THE AMERICAN MUSEUM JOURNAL

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MARY CYNTHIA DICKERSON, *Editor*

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**THE HONORABLE JOSEPH H. CHOATE,
DIPLOMATIST, LAWYER, SPEAKER**

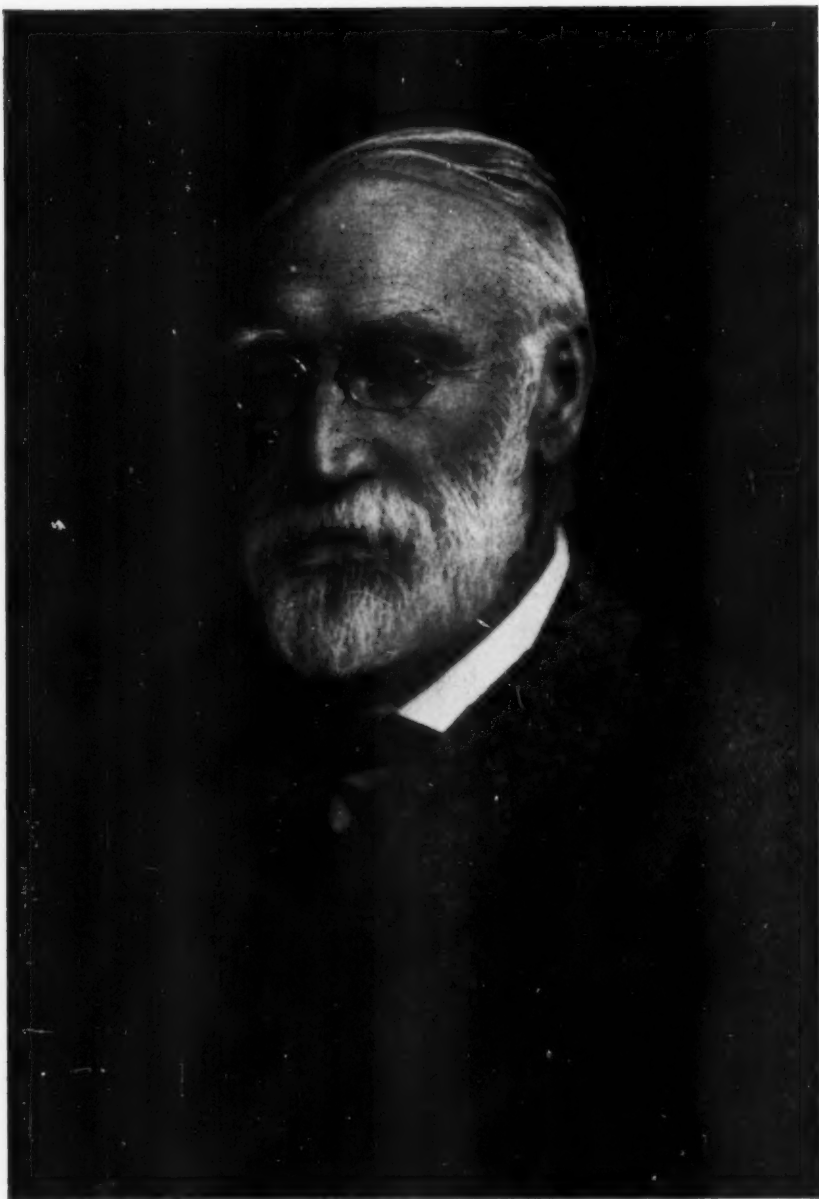
Mr. Choate is the only surviving representative of the founders of the Museum. In 1869 Mr. Choate with Mr. Charles A. Dana and Mr. Theodore Roosevelt, Sr., drafted the constitution for the American Museum of Natural History. Since that early time Mr. Choate has given continually of his means and time and, as legal adviser, especially of his intellect to the welfare of the institution



Photograph by Kermit Roosevelt, reproduced through the courtesy of Scribner's Magazine

COLONEL THEODORE ROOSEVELT WITH COLONEL RONDON

Colonel Roosevelt has just returned from an expedition to South America. He will give his first report of the zoölogical results of this expedition before the members of the American Museum in November. Colonel Rondon of the Brazilian Army, who has explored western Brazil for twenty-four years in pioneering the way for railroads and telegraph lines, joined Colonel Roosevelt at Caceres on the Paraguay and rendered the expedition invaluable services



Photograph by the Misses Selby

DR. JAMES DOUGLAS OF NEW YORK

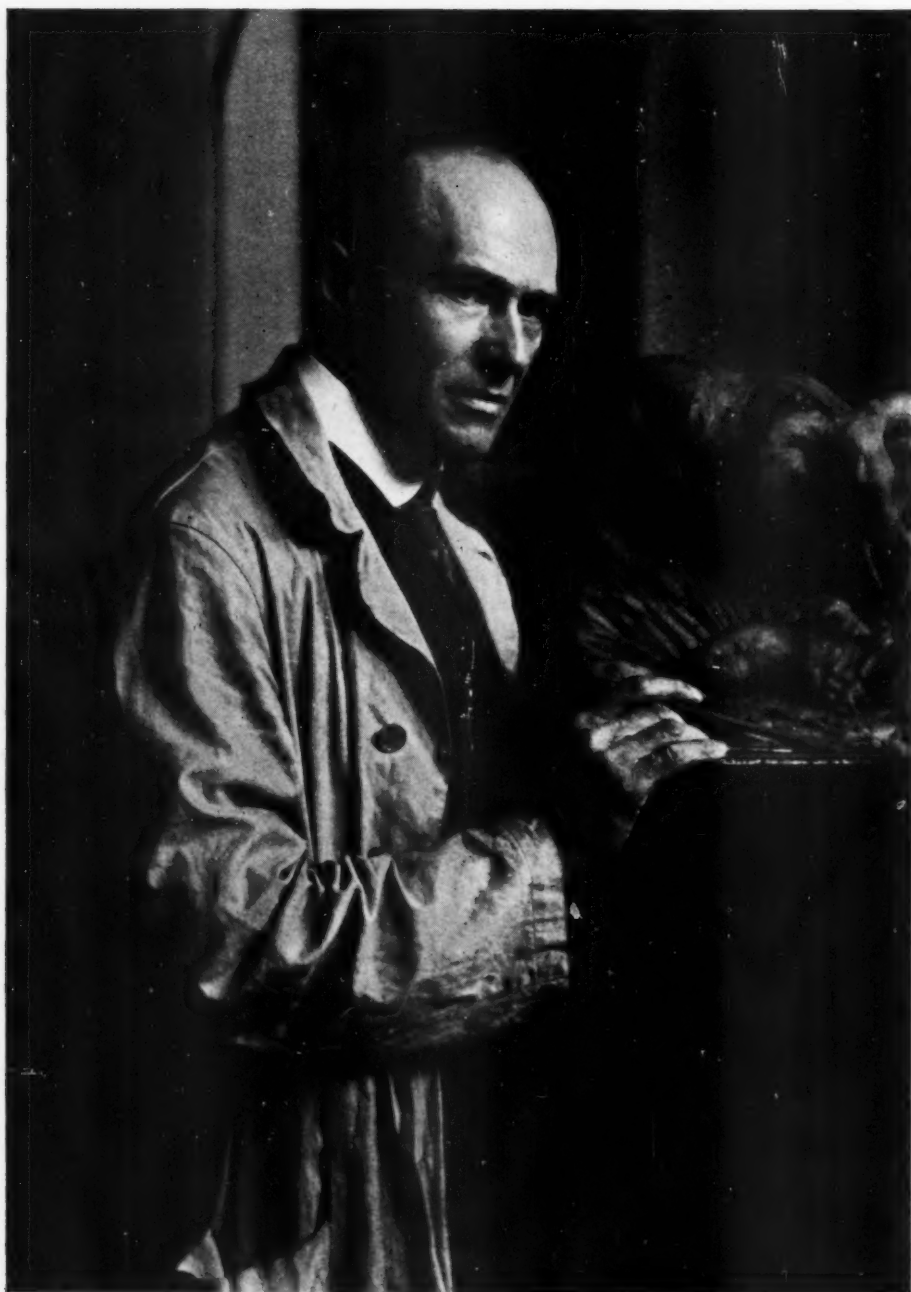
Dr. Douglas, expert mining engineer and president of the Copper Queen Consolidated Mining Company, furnished scientific data for the construction of the Copper Queen mine model in the American Museum. He has also financed the construction and given it his personal supervision during the past three years



Courtesy of the American Press Association

HIS SERENE HIGHNESS ALBERT, PRINCE OF MONACO

His Serene Highness Albert, Prince of Monaco, expert and author in oceanography, founder at Monaco of the largest oceanographical museum in the world, addressed the members of the American Museum of Natural History at the time of his recent visit to America on the subject of his work



MR. CARL E. AKELEY

Mr. Akeley has advanced the art of taxidermy until it implies to-day a combination of the powers of explorer, naturalist and sculptor

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THE NEW AFRICAN HALL PLANNED BY CARL E. AKELEY

PRINCIPLES OF CONSTRUCTION WHICH STRIKE A REVOLUTION IN METHODS OF EXHIBITION AND PRESAGE THE FUTURE GREATNESS OF THE EDUCATIONAL MUSEUM

With detailed description of the African Hall model constructed under the supervision of Mr. Akeley

RAPID progress has been made in America in recent years as regards methods of realistic exhibition of animals in museums; witness the famous mammal groups in the Field Museum, the cycloramic group showing the birds of Laysan Island in the Museum of the University of Iowa, and the habitat bird groups of the American Museum, as also in the American Museum the new reptile groups which show what can be accomplished with wax as a medium, and the wharf-pile group developed in glass. It is unnecessary even to suggest comparison with the often crudely mounted mammals and birds and the discolored shapeless alcoholic material that made up exhibits a few years ago and still in both large and small museums here and abroad often meet the eyes of the visitor seeking instruction in natural history.

Mr. Carl E. Akeley when speaking recently before a joint meeting of the National Sculpture Society, the Architectural League of New York and the MacDowell Club, present at the Museum to view the model of the new African hall, illustrated well the need that existed for advance in the methods of animal exhibition. We quote his story in which he humorously tells of his

own early experience in the work of mounting animals:

When I was a boy I learned taxidermy on my own hook. I borrowed a book that had cost one dollar and from that book I learned taxidermy up to a point where I felt justified in having business cards printed stating that I did artistic taxidermy in all its branches. One day armed with that card I went to the city of Rochester where was located the godfather of all museums, Ward's Natural Science Establishment. After walking up and down in front of Ward's house a number of times, trying to screw up my courage to go in and make application for a position, I finally got my hand upon that card and was reassured. I went in, presented the card to Professor Ward and I assure you he jumped at the opportunity to secure my services — at \$3.50 per week.

Thus I went to Ward's and learned to stuff animals. I have a theory that the first museum taxidermist came into existence in about this way: One of our dear old friends, an old-fashioned closet naturalist who knew animals only as dried skins and had been getting funds from some kind-hearted philanthropist, one day under pressure from the philanthropist, who naturally wanted to see some result from all this money put into the hands of a scientist, sent out around the corner and called in an upholsterer and said, "Here is the skin of an animal. I want you to stuff this thing and make it look like a live animal." The upholsterer did it and kept on doing it until the scientist had a little more money given to him for work. After a while the upholsterer became ambitious and



MRS. CARL E. AKELEY, WHO ACCOMPANIED HER HUSBAND DURING THREE YEARS OF AFRICAN FIELD WORK

had an idea that these animals might be improved upon so he began to do a little better work. But it took more time and cost more money so he lost his job. Thus it has been that from the very people from whom we expected the most encouragement in the beginning of our efforts, we got the least.

I remember very well one time when an opportunity came to do something a little better. A zebra was brought into the Establishment. I had been studying anatomy and I had learned the names of all the muscles and all the bones. When I saw the zebra I realized that here was an opportunity to do something good and I asked to make a plaster cast of the body. I had to do it in my own time and worked from supper until breakfast time, following out a few special experiments of my own in the process. Nevertheless the zebra was handed out to be mounted in the old way and my casts were thrown on the dump.

Fortunately the story does not end here. Let us continue it in a quotation from Professor Henry Fairfield Osborn's introduction of Mr. Akeley before these societies of artists:

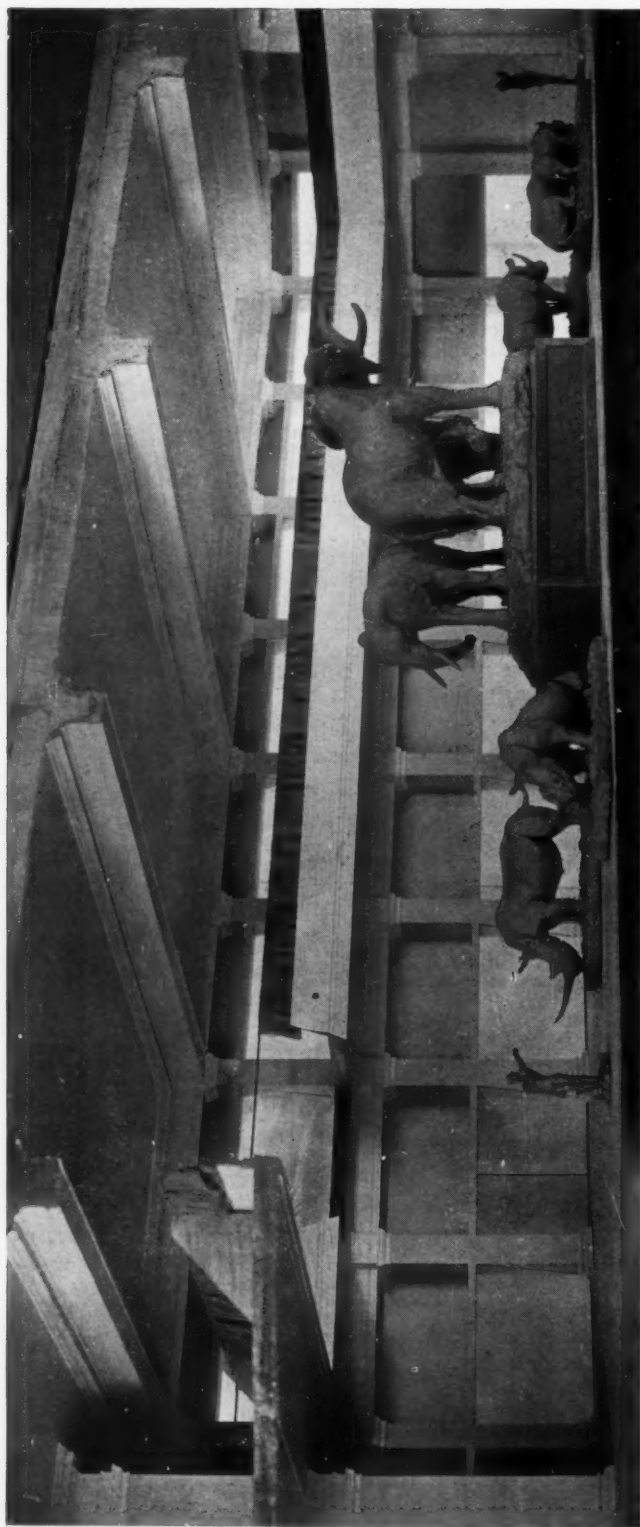
Now all this is changed and Mr. Akeley is the leader of a new movement. He is the first sculptor in this art, the first taxidermist to approach the art from the standpoint of a sculptor instead of from the standpoint of simply filling out the skin, and his great contribution, that which I am sure will make his name endure, is that every one of his animals is first modeled as if the model were to be the completed thing itself. On the surface of the model he succeeds in expressing the muscles, tendons and bones, just as they appear in the living animal. Then he thins the skin down to the utmost possible degree of fineness and applies it to this piece of finished sculpture so that the skin here, as in the case of the living animal, is drawn down over the beautifully modeled body.

Another great feature of Mr. Akeley's work, which makes him a leader in the new movement, is that through his courage as an explorer he has been out and studied his types in the wild, often at very great personal risk. The animal of the wild is entirely different from the museum or menagerie animal. The muscles, the vitality make the whole aspect something quite different. It

is the wild animal that Mr. Akeley will put into the new African hall.

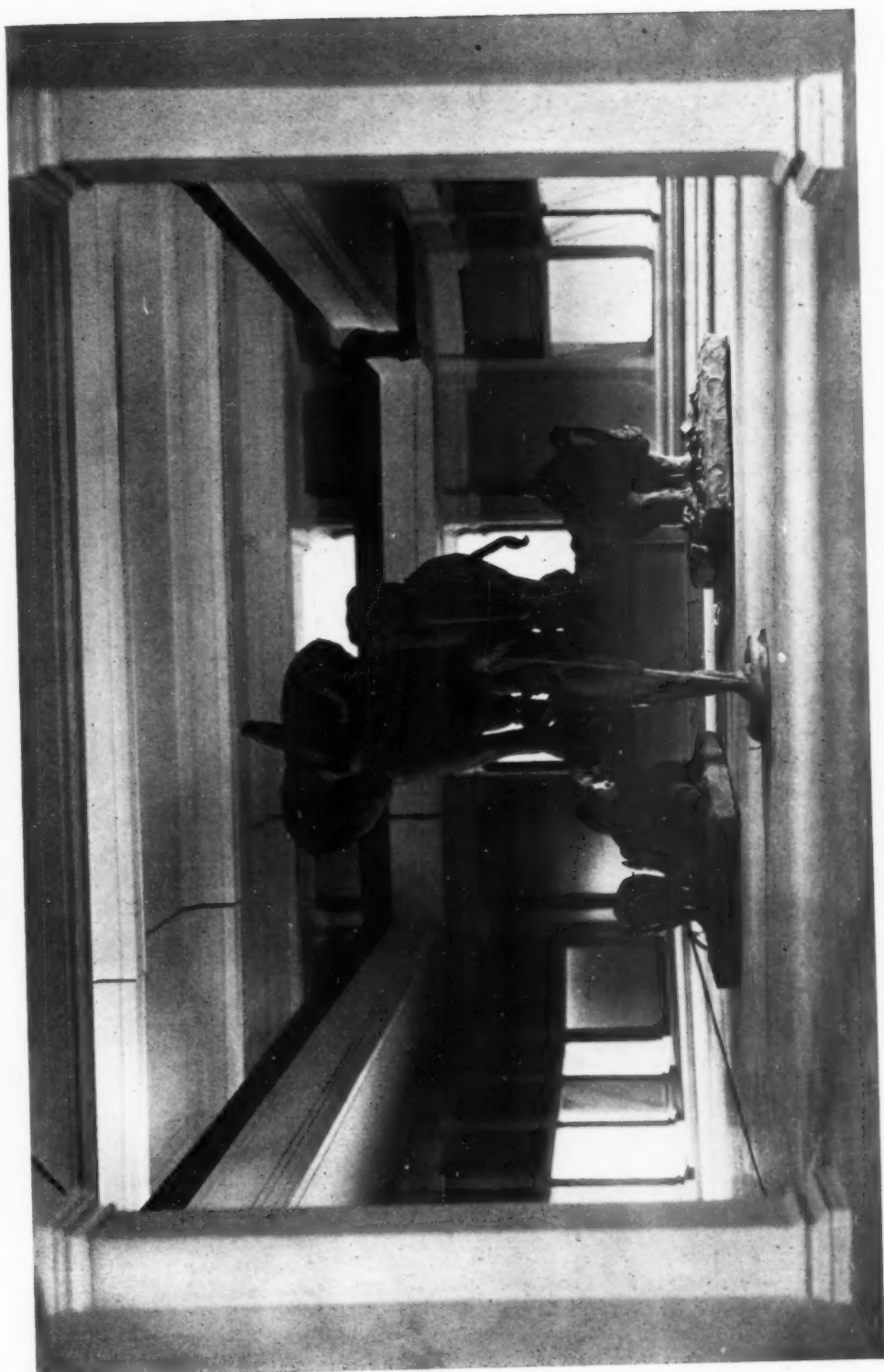
What has been done so far however to improve museum exhibition is but a small beginning of what can be and should be done, especially in the museums of large cities where the educational need is greatest. Any person who has studied the matter or who is interested either as artist or scientist, will agree to this as he walks through the exhibition halls of any of the world's public natural history museums. In few can there be found a single hall whose plan reveals a master mind or correlation in the work of several minds. There are chances for the architecture to be out of harmony with the subject or character of the exhibits, for the lighting to be unfortunately managed. Owing to an institution's inheritance of old material and frequent changes of administration, the exhibits may be heterogeneous, a little done here by one man with one aim, a little yonder by another with a different aim; they are no doubt crowded and with small appearance of attractiveness. The cases may be out of keeping with the exhibits, perhaps even ranging through many styles and sizes. All this in addition to the fact that the animals were prepared for exhibition by some method which gives no illusion of life.

Mr. Akeley stands foremost among museum men interested in museum exhibition—an African explorer, naturalist and sculptor, and the title he modestly claims, "taxidermist"—a man with such capacity for keen observation of animals and such genius in a true representation of them that he honors the old term taxidermist until whatever lowly origin the word may have had, it is made now to imply a combination of the powers of explorer, naturalist and sculptor. By thus remaining loyal to the



MODEL OF AFRICAN HALL

Side view showing arrangement of exhibits on main floor, and spaces at sides of main floor and gallery to be occupied by panoramic groups and bronzes as shown on page 181. The elephant group now being mounted at the Museum will occupy the central position on the main floor and will be flanked at either end by a bull, cow and calf of the black and the white rhinoceros respectively and also by a native figure in bronze [fountain]. These two native figures will be life-size and will serve as a scale to the dimensions of the hall



MODEL OF AFRICAN HALL

View showing main floor installation from entrance to hall. Mr. Akeley has so advanced methods of taxidermy that these elephant and rhino groups will be permanent without protection from dust and changing atmospheric conditions, requiring only the care given to bronzes

old name and continuing to give his services in his old profession, Mr. Akeley has set a new standard for all workers in museum preparation, more-over making it possible that men of great ability shall come into the ranks and impossible for men of poor ability to rise there. This in itself, striking as it does at the foundation for improvement, is bound to influence museums in the future. Fortunately however and yielding more immediate and definite results than this, Mr. Akeley has crystallized into workable plans the ideas gained through his study of museum exhibition. These were largely perfected some years ago for the Field Museum, Chicago, but are now offered in more matured form to the American Museum in the shape of an African hall for the new wing under construction.

During the past year working in one of the old North American mammal halls of the second floor of the Museum, rechristened the "elephant studio," Mr. Akeley has supervised the construction of a very beautiful model of the African hall. The following is his own description of the hall as portrayed by the model:

This new hall will be devoted entirely to Africa — to African scenes and African animals and African natives in their relation to the animals. The hall proper will have a floor measurement of sixty by one hundred and fifty-two feet and a height of seventeen feet to the gallery at the sides and thirty feet to the ceiling over the center. The open space of this hall will be encroached upon only at the corners by the elevators, that is the actual open floor space without columns or any obstruction whatever will be sixty by one hundred and sixteen feet. In the center of this large hall will stand a group of four African elephants treated in statuesque fashion, mounted on a four-foot base with no covering of glass. It is suitable that the elephant should dominate this hall since it is typical of Africa, is the largest land mammal

in the world to-day and one of the most splendid of all animals of past or present.

As a result of late developments in the technique of taxidermy we are able to treat these pachyderms so that they will not suffer because of lack of protection under glass. Changing atmospheric conditions will have no effect upon them and they can receive essentially the care given to bronzes.

The elephant group will be flanked at one end by a group of black rhinos, a bull at one side, a cow and calf at the other, and at the other end by a similar group of white rhinos, the rhino groups being prepared for the same exposure as the elephant group. The elephants and the rhinos, with the addition of two fountains, one at either end facing the entrances of the hall and consisting each of a single native figure, life-size in bronze, will constitute the only installation in this hall proper.

If we stand in this hall where are the elephants and rhinos and look to right and left out through what might seem the windows of the hall, we shall see typical African scenes, for the groups of the African hall will surround the main floor in a sort of annex which will not encroach upon the measurements of the hall proper. These animal groups with panoramic backgrounds¹ will be twenty in number on the main floor, with twenty more of the same type although somewhat smaller in dimensions, in the gallery.

The forty canvases for the groups will be painted by the best artists available and from studies made in Africa, and will give a comprehensive idea of the topography of Africa from the Mediterranean on the north to the Tableland Mountain at Cape Town and from the east coast to the west coast.

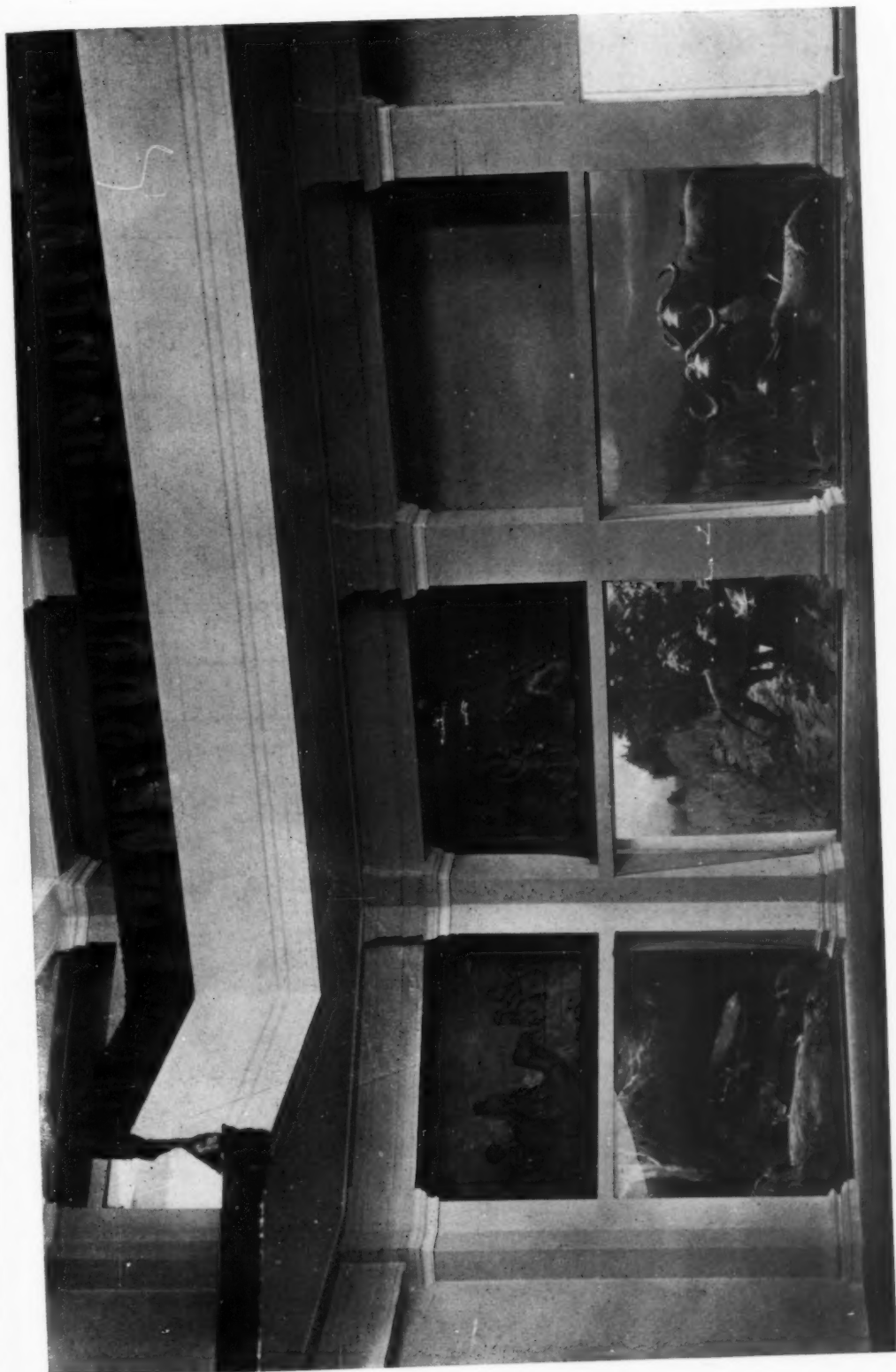
The foregrounds of the groups will combine to represent in the most comprehensive way the animal life of the continent. They will be composite — that is, as many species will be associated in each of the groups as is legitimate with scientific fact. For example one of the large corner groups will represent a

¹The paintings making the backgrounds of these forty groups will range in size as follows:

In the gallery, canvas measurement 16 feet by 28 feet for groups 13 feet in width by 7½ feet in depth

On the main floor, canvas measurement 30 feet by 70 feet for the four large corner groups, 24 by 24 feet

Also on the main floor, canvas measurement 25 feet by 42 feet for sixteen groups each 15 by 13 feet



FINISHED CORNER OF AFRICAN HALL MODEL

This shows three of the twenty large panoramic groups and two of the twenty-four bronze panels of the gallery. The backgrounds of these twenty panoramic groups supplemented by the twenty smaller groups of the gallery are planned to give a comprehensive idea of the topography of the continent of Africa, each one being used as a background for a group of animals characteristic of the region shown. The bronze panels are treated as a part of the decoration of the hall, subordinate in a sense but of great importance, as the theme of the whole series is to show the relationship between the natives of Africa and the animal life

scene on the equatorial river Tana, showing perhaps all told twelve species in their natural surroundings with stories of the animals and a correct representation of the flora. In the foreground on a sandbar in the river will be a group of hippos; across the stream and merging into the painted background, a group of impalla come down to water; in the trees and on the sandbars of the farther bank two species of monkeys common to the region; a crocodile and turtles basking in the sun near the hippos and a few characteristic birds in the trees.

Another of these large corner groups will be a scene of the plains, a rock kopje with characteristic animals such as the kilpspringer, hyrax, Chanler's reedbeek and baboons on

the rocks. The background will lead off across the plain showing a herd of plains animals — and the adjoining group will continue the story showing more of the species of the plains. The third of the large corner groups will represent a Congo forest scene with the okapi and chimpanzee perhaps, and such animals as may be legitimately associated with the okapi. The fourth group is to be a desert scene, a water hole with a giraffe drinking and other animals standing by, awaiting their turn.

In these four corner groups we can present the four important physical features of African game country and they will be supplemented of course by the scenes in the thirty-six other groups. The large groups however,



Sketch model of the hippopotamus group, one of the four large corner groups on the main floor. A scene on the Tana River, showing a hippopotamus family on a rock in the center of the river and an antelope drinking on the opposite shore. There will be several other species of mammals and birds shown as accessories in this group

give opportunity for particularly striking scenic effects.

Lack of care in museum exhibition has come about in part at least because of the lack of permanence in the specimens exhibited. Now that we have reached a point in the development of taxidermy technique where we can say without reservation that our preparations are permanent, permanent to a degree only dreamed of up to within a couple of years, we feel justified in taking extreme measures to insure the future care and preservation of these preparations. The elephants and rhinos can be made as permanent as bronze for endurance under all conditions, but the other animal groups with

rays of light. The space between these two skylights will be a cooling space — that is, air will circulate through this space, modifying the heat of the summer sun or the cold of winter. Each group will be in fact within an individual compartment, and allowed to "breathe" only the air of the alleyway, which is filtered and dried and kept at a uniform temperature throughout the year. The daylight admitted through the skylight is under automatic control so that after the amount of lighting of an individual group has been definitely determined upon, it is kept at the proper amount by automatically controlled shutters which open and close with the changing light, maintaining a uniform light



Lion and Buffalo — A model for bronze by Carl E. Akeley

their backgrounds and with accessories necessarily made largely of wax, cannot be thus exposed. That they shall not suffer from excessive light and from changing atmospheric conditions, they will be placed in these two great alleyways on either side of but practically outside the hall, in fact hermetically sealed off from the hall proper and also from the outside atmosphere. Thus each group will be absolutely protected from changes in temperature and humidity.

The lighting of the groups will be a combination of daylight and artificial light. Daylight will be admitted through a skylight beneath which a second skylight will serve as a ray-filter to cut out the actinic or fading

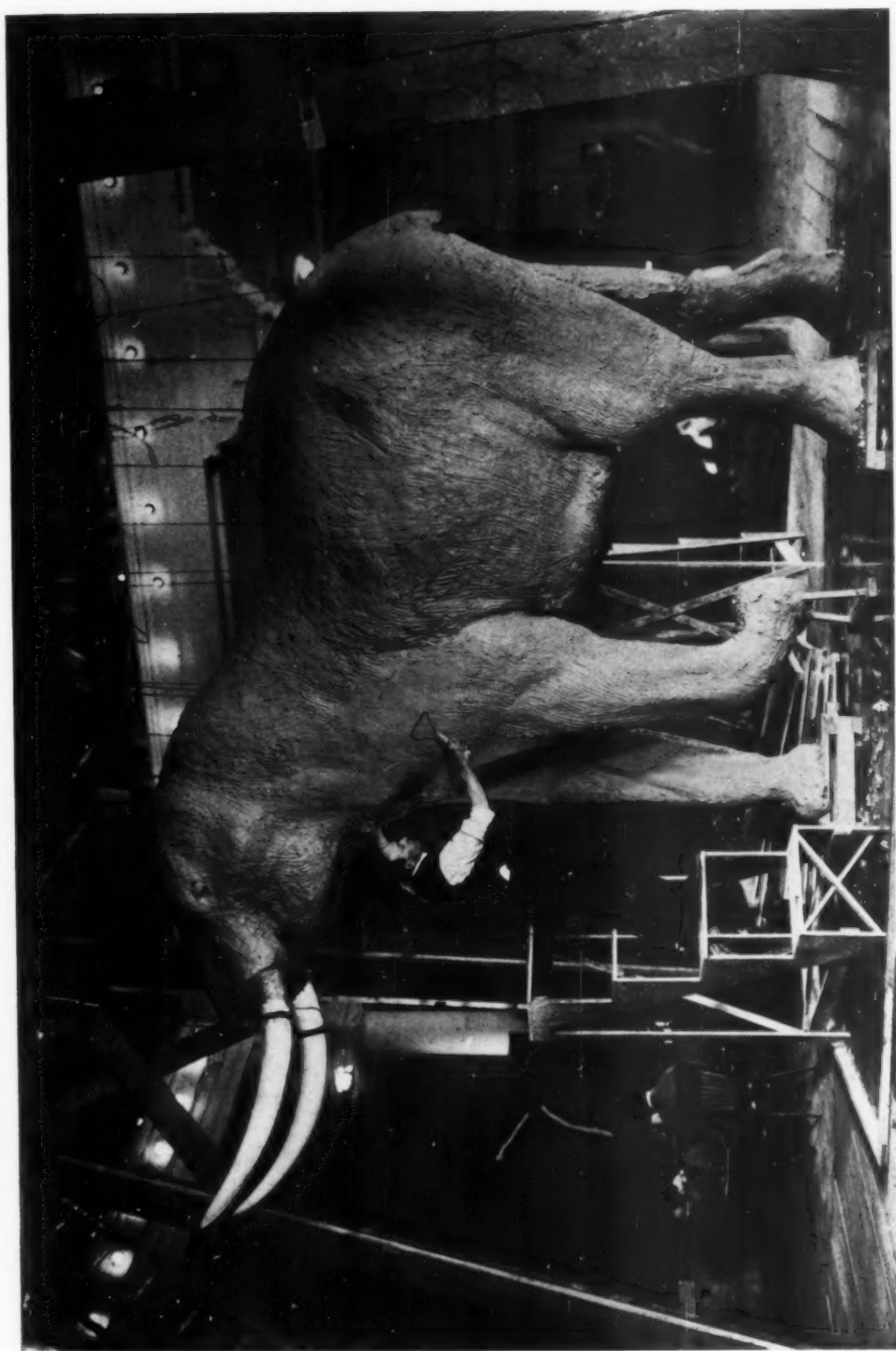
on the group under all conditions.

The amount of light required on these groups will be relatively small because of the fact that they are to be viewed from a relatively dark central hall. We shall be looking from the hall into the source of light rather than from the source of light outward. Also reflections can be reduced to a minimum and practically eliminated, owing to the fact that the groups are the source of illumination, by having the glass in the front of the case inclined at such an angle that it reflects only the dark floor of the hall. The effect as we pass through this hall will be that of looking out through open windows into an African out of doors.

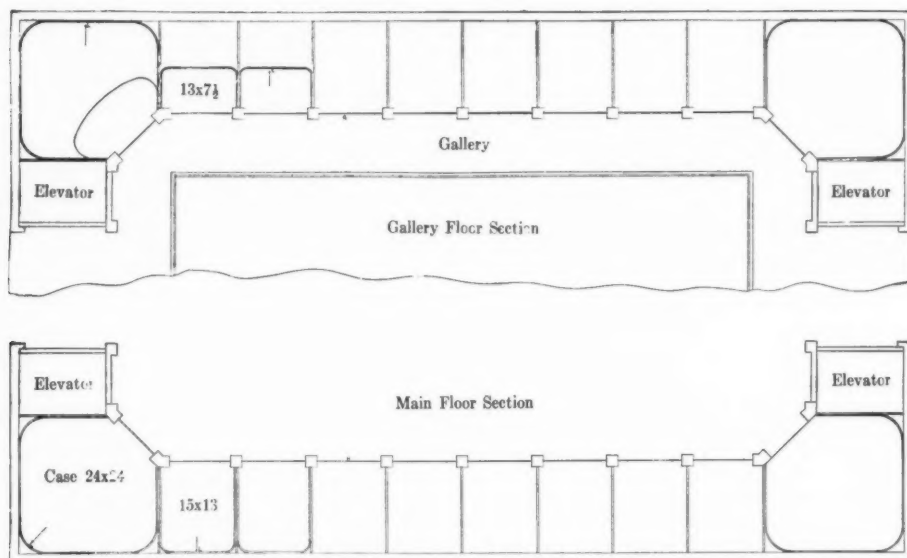


MODEL FOR BRONZE BY CARL E. AKELEY

Charging herd of elephants. Based on one of Mr. Akeley's experiences in Africa when a herd of eleven cow elephants charged on wind from a distance of four hundred yards



A CORNER OF THE ELEPHANT STUDIO
Mr. Akeley working on the model of the big bull elephant which is to be the central figure of the dominant group of the African hall



Plan of hall showing main floor and gallery of African hall

In addition to the forty groups twenty-four bas-relief panels in bronze (six by eleven feet each) will be placed in a frieze just above the floor groups and along the balcony to form a series around the entire lower floor, becoming a part of the architectural decoration of the hall. The sculpture of each panel will tell the story of some native tribe and its relations to the animal life shown in the groups.

For instance, one will show a Dorobo family, the man skinning a dead antelope that he has brought in from the forest to his hut, where are his wife and babies and two hunting dogs which represent their only domestic animals. A further interest in animal life will be revealed in the presence of the dead antelope as it is a source of food supply, for these are people that live entirely by hunting. Another panel may show a group in Somaliland with camels, sheep, goats, cattle and ponies at a water-hole, the interest in animal life being practically only in domestic animals. Still another panel completing the Somali story will represent a group of Midgans in some characteristic hunting scene. While each of these panels is to be a careful and scientifically accurate study of the people and their customs, accurate in detail as to clothing, ornaments and weapons, the theme running through the whole series will be

the relationship of the people to the animal life.

Thus the American Museum takes the important step of putting this comprehensive piece of work into the hands of one man and he a man who has proved his peculiar ability. Mr. Akeley is willing to sacrifice other interests for the five years necessary for the well launching of the plan. He will draw into the work the best "taxidermists," as well as sculptors and artists. He will in fact start a "taxidermy studio" which during these five years will be not only a place where groups for the African hall shall be prepared but what is more important, will also prove a training-ground for young men of ability and marked aptitude for the work. We can but agree that Mr. Akeley has put his finger upon the crucial difficulty in Museum exhibition when he says, "After all is said and done such work depends on just a few men who can carry it out. To find people who can do the work, men of fit training and sense to carry it to the finish, that is the difficult matter."

It is impossible for us to estimate the vast influence that Mr. Akeley's new "taxidermy studio" will have on museum installation. It will achieve a direct influence in presenting to the world such an example as the African hall will be when embodied forth in its full dimensions — a place of large and quiet beauty, with long unobstructed views, where one

may sit and rest while he learns of the life of Africa. There is certain to come also a stimulated enthusiasm for work in museum exhibition and results continually approaching more and more near the ideal — that is, absolute scientific truth giving an illusion of the life itself, combined with great beauty and with permanence.

M. C. D.

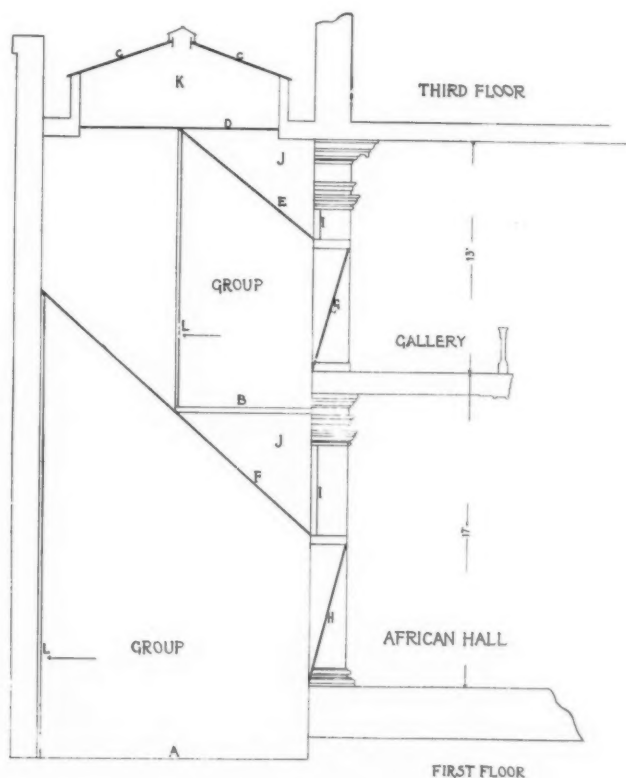


Diagram of a section of the corridor containing main floor and gallery groups

- A. Floor of group space, sunk four feet below the level of hall floor to permit of various elevations of foreground in group;
- B. Floor of gallery group case, two feet below the level of gallery floor;
- C. Skylight;
- D. Ray filter. Colored glass to cut out actinic rays of daylight;
- E. Glass roof of gallery group case;
- F. Glass roof of main floor group case;
- G. Glass in front of gallery case set at angle to cut out reflections;
- H. Glass in main floor case;
- I. Space occupied by bronze panels above the floor groups;
- J. Space above gallery groups to be used for artificial lighting purposes;
- K. Ventilated space between skylight and ray filter;
- L. Plane of painted background.



THE PILTDOWN MAN IN LIFE

Fig. 1. A restoration by Professor J. H. McGregor

THE DAWN MAN OF PILTDOWN, ENGLAND

By William King Gregory

SEVERAL years ago an English geologist, Charles Dawson, F. S. A., F. G. S., was walking along a farm road close to Piltdown Common, Fletching, Sussex, when he noticed that the road had been mended with some peculiar brown flints not usual in the district. On inquiry, he relates,¹ he was

¹ Quar. Jour. Geol. Soc., vol. 69, pp. 117-144
Paper read Dec. 18, 1912.

[NOTE: The now celebrated fossil human remains found at Piltdown, in Sussex, continue to excite widespread discussion and interest not only in scientific circles but also in the public press both here and abroad. The following summary has been made after a patient and impartial study of this still controversial subject. The Dawn Man is illustrated by means of casts and models which are on exhibition in this Museum, in the loan collection of Dr. J. Leon Williams.]

astonished to learn that the flints were dug from a gravel-bed on a certain farm, and shortly afterward he visited the place, where two laborers were at work digging the gravel for small repairs to the roads. As this excavation was situated about four miles north of the limit where the occurrence of flints overlying the Wealden strata is recorded, Mr. Dawson was much interested, and made a close examination of the bed. "I asked the workmen," he says, "if they had found bones or other fossils there. As they did not appear to have noticed anything of the sort, I urged them to preserve anything that they might find. Upon one of my subsequent

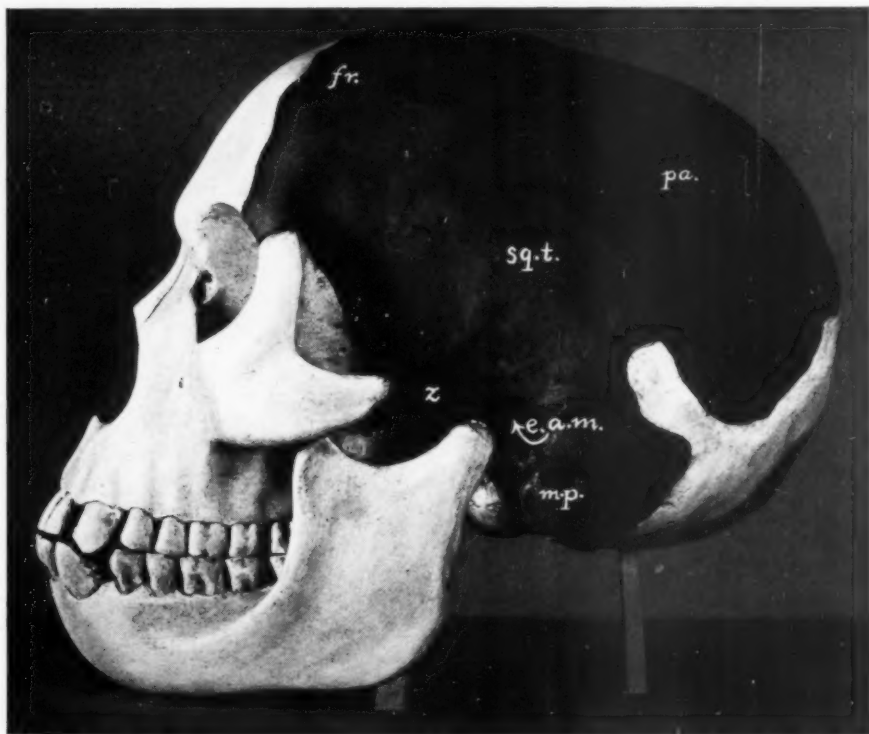


Fig. 2. Model of the Piltdown skull as reconstructed by Dr. Smith Woodward. Seen from the left side; one-half natural size. Williams Collection, American Museum

The dark areas represent the portions preserved in the original fossil; the light areas are restored. The lower jaw (except the front part) is restored from the opposite side

visits to the [gravel] pit, one of the men handed to me a small portion of an unusually thick human parietal bone. I immediately made a search, but could find nothing more, nor had the men noticed anything else. The bed is full of tabular pieces of iron-stone closely resembling this piece of skull in color and thickness; and, although I made many subsequent searches, I could not hear of any further find nor discover anything—in fact, the bed seemed to be quite unfossiliferous.” But incited by the skull fragment already obtained, Mr. Dawson renewed the search in the autumn of 1911, when he was rewarded for his persistence by picking up among the rain-washed spoil-heaps of the gravel-pit, another and larger piece belonging to the frontal region of the same skull. “As I had examined a cast of the Heidelberg jaw,” he continues, “it occurred to me that the proportions of the skull were similar to those of that specimen. I accordingly took it to Dr. A. Smith Woodward at the British Museum [Natural History] for comparison and determination. He was immediately impressed with the importance of the discovery, and we decided to employ labor and to make a systematic search among the spoil-heaps and gravel, as soon as the floods had abated; for the gravel-pit is more or less under water during five or six months of the year. We accordingly gave up as much time as we could spare since last spring (1912), and completely turned over and sifted what spoil-material remained; we also dug up and sifted such portions of the gravel as had been left undisturbed by the workmen.... Apparently the whole or greater portion of the human skull had been shattered by the workmen, who had thrown away the pieces unnoticed. Of these we recovered from the spoil-heaps as many fragments as

possible. In a somewhat deeper depression of the undisturbed gravel I found the right half of a human mandible. So far as I could judge, guiding myself by the position of a tree three or four yards away, the spot was identical with that upon which the men were at work when the first portion of the cranium was found several years ago. Dr. Woodward also dug up a small portion of the occipital bone of the skull from within a yard of the point where the jaw was discovered, and at precisely the same level. The jaw appeared to have been broken at the symphysis, and abraded, perhaps when it lay fixed in the gravel, and before its complete deposition. The fragments of the cranium show little or no sign of rolling or other abrasion, save an incision at the back of the parietal, probably caused by a workman's pick.¹”

Further exploration during 1913 resulted in the finding, by Father P. Teilhard de Chardin, S. J., of an apelike canine tooth in the dark bed of the gravel, the same stratum which had yielded the skull and the mandible. The nasal bones were also found in the same bed.

GEOLOGICAL AGE OF THE PILTDOWN MAN

The question of the geological age of these now celebrated specimens is naturally of first importance. It has been suspected by some that geologically they are not old at all; that they may even represent a deliberate hoax, a negro or Australian skull and a broken ape-jaw, artificially fossilized and “planted” in the gravel-bed, to fool the scientists. Against this suggestion tell the whole circumstances of the discovery as above

¹ “This wretched pickaxe added yet another obstacle. It cut off the fore-part of the jaw, bearing the front cheek-teeth, the ‘eye’ teeth, or canines, and the cutting-teeth.” W. P. Pycraft

related. None of the experts who have scrutinized the specimens and the gravel-pit and its surroundings has doubted the genuineness of the discovery. All agree that the Dawn Man dates at the very latest from the Old Stone Age, and for the following reasons:

1 — The dark stratum which yielded the human remains also contained a number of mammalian fossils, representing a primitive elephant (*Stegodon*), a mastodon (*Mastodon arvernensis*), a rhinoceros, a hippopotamus, a horse and a beaver. The mastodon and the stegodon belonged to species which were characteristic of the Pliocene epoch and on that account Professor Keith at first regarded the human remains as equally old; but Dr. Smith Woodward and Mr. Dawson maintained that the mastodon and rhinoceros teeth had been washed into the gravel bed from an older formation, because they had been rolled and were water-worn. The hippopotamus and the beaver may be of either Upper Pliocene or Pleistocene age. A fragmentary fossil antler of a red deer was found near by, but its association with the other remains is doubted.

2 — "Eoliths," or irregularly fractured flints, were also found in and around the gravel-pit.

3 — One flint implement of Old Stone Age type was discovered *in situ* in the bed which lies immediately above the Dawn Man stratum. (See also Fig. 11.)

In brief, the discoverers of the Dawn Man finally refer his remains to the Palæolithic (Old Stone Age),¹ but the more precise date is not settled.

DR. SMITH WOODWARD'S RECONSTRUCTION OF THE SKULL AND JAW

The broken pieces of the Piltdown

¹ Supplementary Note on the Discovery of a Palæolithic Human Skull and Mandible at Piltdown (Sussex). Proc. Geol. Soc., London, vol. lxx, 1914, pp. 82-93.

skull were compared by Dr. Smith Woodward with various human types both prehistoric and modern, and under his direction the pieces were assembled as far as possible in their natural positions and the missing parts were hypothetically restored in clay. As shown in this reconstruction (Page 189) these missing parts (indicated by the white areas) include the front part of the lower jaw, the lower incisors, canines and premolars, all the upper teeth and the face. Since that time the nasal bones and one canine tooth have been found.

The most extraordinary, unexpected feature of the Piltdown man, as thus reconstructed, is that an essentially human brain case, with a well-rounded forehead and with thoroughly human temporal and occipital regions, is combined with an essentially apelike lower jaw, with apelike teeth and with an apelike face (the latter hypothetical).

DID THE APELIKE JAW BELONG WITH THE HUMAN BRAIN-CASE?

Doubts and criticisms were raised at once. Doubt as to the association of the lower jaw with the skull was expressed by several authorities (Sir Ray Lankester, Professor Waterson and Professor Schwalbe) and is still entertained by many conservative anatomists. Did this ape jaw really belong with the human brain-case? Could an ape jaw articulate with a human jaw-socket?

Briefly summarized the principal items of evidence bearing on this question are as follows:

1 — The jaw was found in the same stratum which had yielded the skull, and within a yard of the exact spot where a piece of the occipital bone was found. Subsequently the nasal bones and a canine tooth were found in the same place.

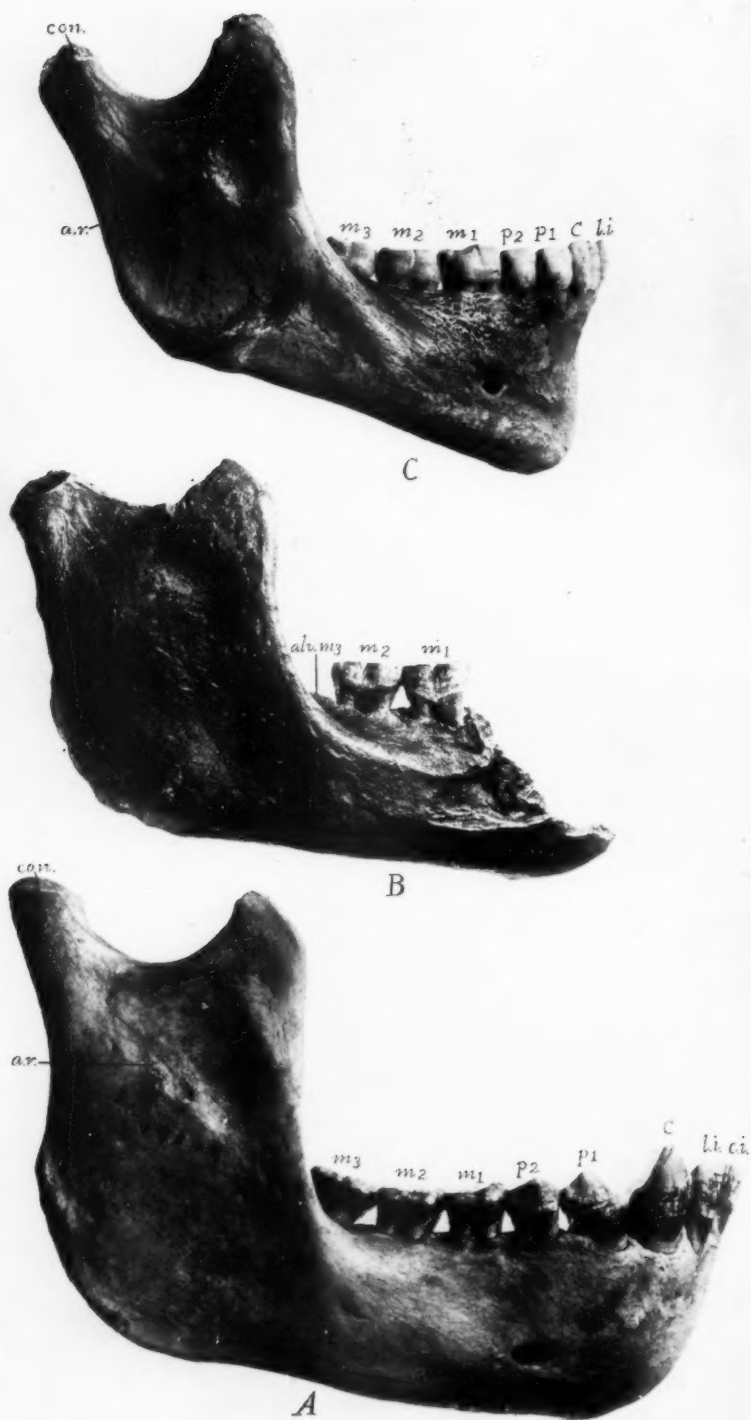


Fig. 3. The Pittdown lower jaw (B) from a cast in the Williams Collection, compared with the jaws of a female orang-utan (A) and of a modern man (negro) (C). External views, three-fourths of the natural size. Abbreviations: *a.l.v. m3*, socket for third lower molar; *a. r.*, ascending ramus; *c*, canine; *c. i.*, central incisor; *con.*, condyle; *l. i.*, lateral incisor; *m1, m2, m3*, first, second, third lower molars; *p1, p2*, first and second premolars (equivalent to the third and fourth premolars of lower mammals)

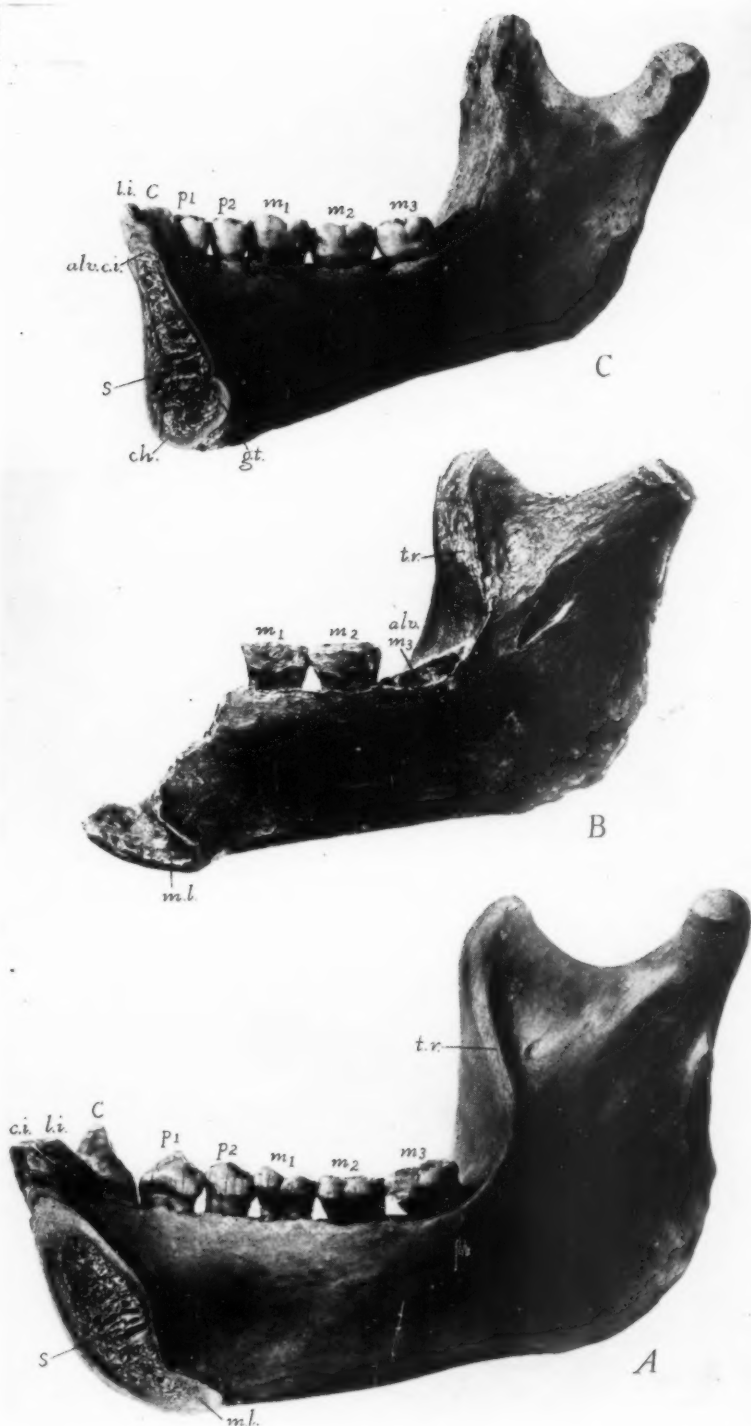


Fig. 4. Lower jaw bones of the Piltdown man, of a female orang-utan and of a modern negro, viewed from the inner side. Abbreviations as in Fig. 3; also, *alu. c. i.*, alveolus for central incisor; *ch.*, bony chin; *g. t.*, genial tubercle; *m. l.*, mental ledge; *t. r.*, ridge in area of temporal muscle; *s*, section through symphysis

2—The jaw and skull are fossilized in the same manner and degree.

3—They were found in an ancient gravel-bed containing the débris of older deposits. "As the skull and lower jaw are very little water-worn, they would not have occurred in close association if they had been transported far from

cene Age have been discovered in the glacial and interglacial deposits of England and the Continent, but in this highly varied fauna the anthropoid apes have always been conspicuously absent, and there is no reliable evidence that any of the race ever lived in England during the Pleistocene Epoch.

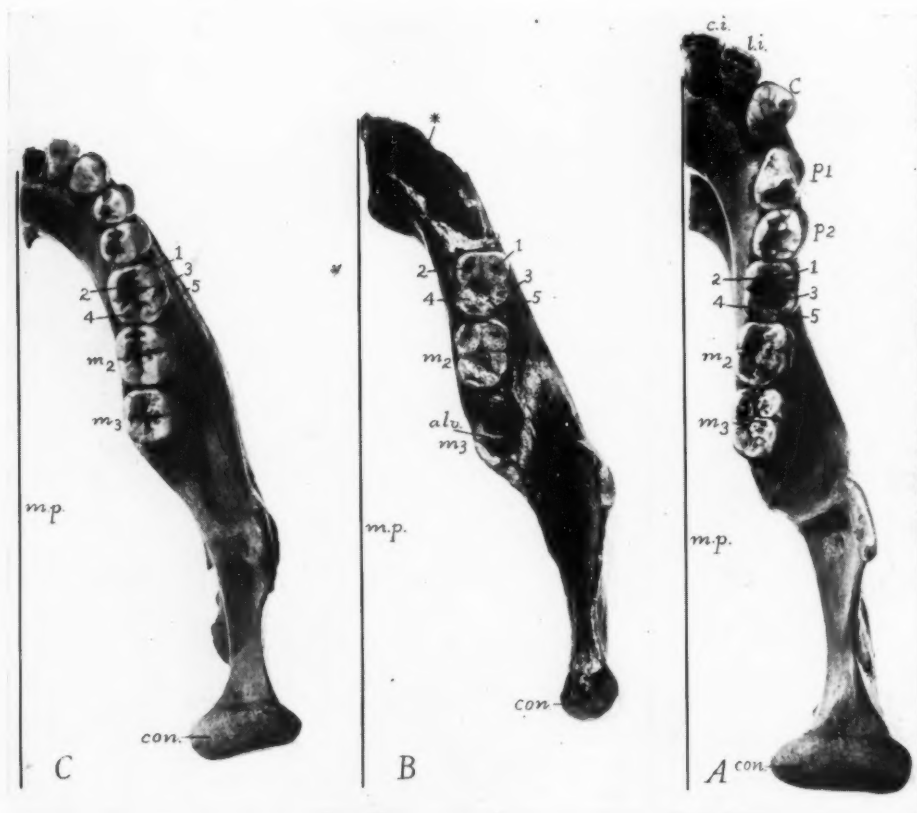


Fig. 5. The same three specimens of Figs. 3 and 4, viewed from above. Abbreviations as in previous figures; also, 1, 2, 3, 4, 5, cusps of the lower molars; *m. p.*, median plane; *, broken edge

the spot at which they were originally entombed" (Smith Woodward).

4—The suggestion that while the brain-case was human, the lower jaw belonged to another creature, an ape, is not in harmony with what is already known of the fauna and climate of Europe during Pleistocene times. Thousands of mammalian remains of Pleisto-

5—Fossil remains of anthropoids of any age have hitherto been exceedingly rare, and the chances that a jaw of a hitherto unknown type of anthropoid ape should be washed into the same gravel-bed with a human skull of conformable size, and that both should become mineralized in the same manner and degree, may be regarded as extremely small.

6—More direct evidence that the lower jaw in spite of its apelike features is really that of a human being is furnished by the measurements given by Dr. Smith Woodward (*op. cit.*, p. 130). These measurements are on the whole nearer to those obtained from early human jaws than to those of full-grown apes.

7—The lower molars approach those of apes in their relative narrowness and in the large size of the third lower molar (as indicated by its alveolus), but in their flattened worn surfaces with very thick enamel they recall human rather than simian teeth.

8—The condyles, or articular surfaces, of the Piltdown jaw as compared with those of the great apes were more slender, less expanded transversely, and supported by more slender pillars of bone. In this feature the Piltdown jaw is more like the average human type, and this fact tends to remove the supposed difficulty in fitting this, in many ways apelike jaw on to a human glenoid, or upper jaw socket.

9—Doubts have also been expressed as to the association of the remarkably apelike canine with the other Piltdown

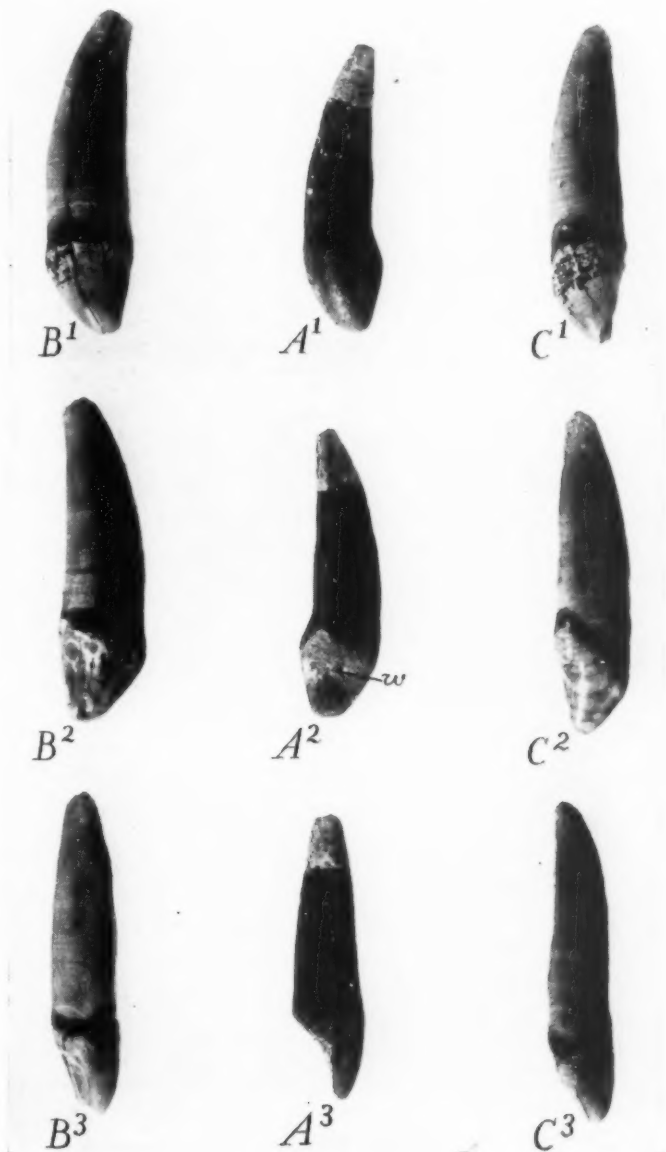


Fig. 6. Canine tooth (cast) of the Piltdown man (A) in comparison with the left upper (B) and right lower (C) canines of a female orang. Natural size. The lower canine is turned upside down to facilitate comparison with the others. In A the tip of the root is restored

A¹, B¹, C¹. Seen from the outer or labial side

A², B², C². Seen from the inner or lingual side. w, worn surface

A³, B³, C³. Seen from the front, or antero-internally



Fig. 7. Temporal bones of the Piltdown man (A), of a negro (B), and of a female orang-utan (C). Two-thirds natural size

ar. e., articular eminence (for lower jaw); c. c., carotid canal; e. a. m., opening leading to middle ear; g. s., glenoid socket (for lower jaw); pet., bone surrounding internal ear; st., pit for styloid process; t. p., tympanic plate; z, root of zygomatic arch

remains. The canine, which was discovered by Father Teilhard in the place where the other remains came from, was identified by Dr. Smith Woodward as belonging in the right side of the lower jaw; but as shown in figure 6, by comparison with the upper and lower canines of a female orang, its resemblances are on the whole closer to the left upper canine, as observed by Mr. A. E.

Anderson. If it be an upper canine its wearing surface is such that the first lower bicuspid which occluded with it must have been elongate and prominent and much more anthropoid than human in shape. Taken in connection with the total lack of a chin, and with the straightness of the molar tooth rows, this indicates that the lower part of the face and the dentition were even more apelike than in Dr. Smith Woodward's reconstruction. If the canine be an upper one, this would tend to confirm the association of the jaw with the skull, in the opinion of American Museum collectors.

While perhaps not conclusive the foregoing considerations tend strongly to show that all the Primate remains so far discovered at Piltdown belonged to one individual, which is represented by the greater portion of the brain-case, by the nasal bones, by the left upper

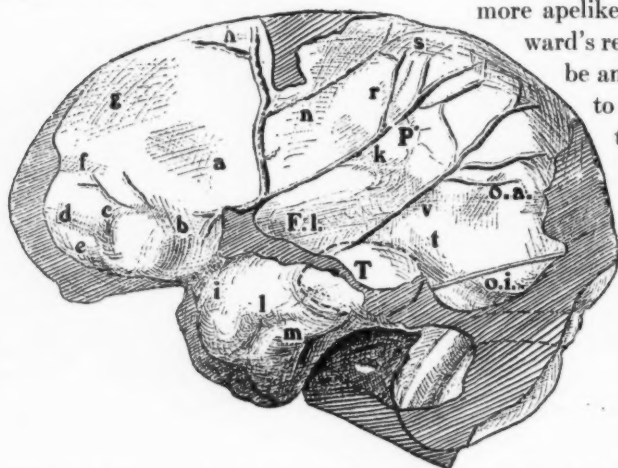


Fig. 8. Internal cast of the Piltdown skull. The fully shaded parts are represented in the original, the rest is restored. After Elliot Smith. The branching system represents the grooves for the meningeal arteries which are on the inner surface of the brain-case

canine tooth and by the imperfect right half of the lower jaw, the remaining pieces

presumably having been destroyed by the workmen in taking out the gravel.

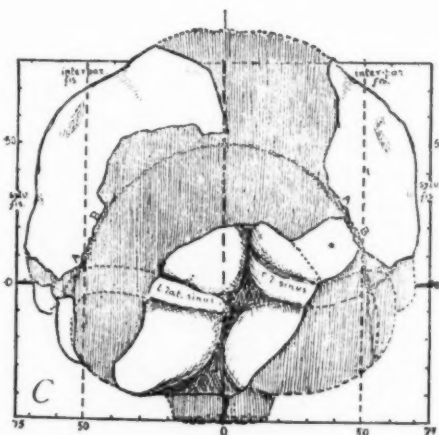
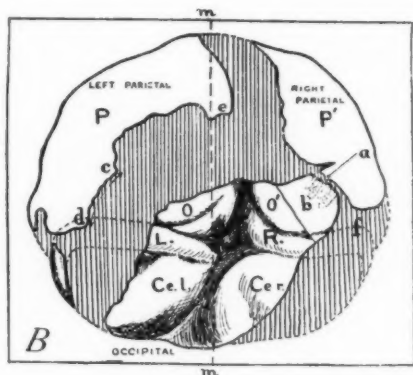
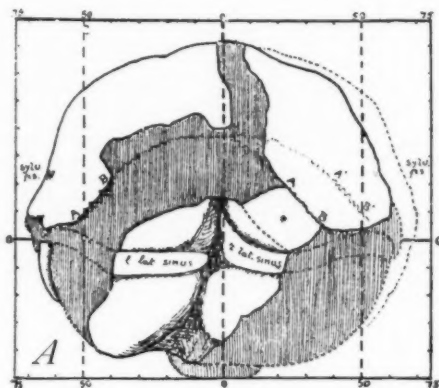


Fig. 9. Projections of the brain-case as seen from the rear, as reconstructed by Professors Smith Woodward (A), Elliot Smith (B), and Keith (C)

DID THE PILTDOWN MAN HAVE A VERY LARGE BRAIN CASE?

We come now to the most controversial part of the whole subject. Did the Piltdown man have a small brain-case as in Dr. Smith Woodward's reconstruction (Fig. 9 A), or a very large one as in Professor Keith's reconstruction (Fig. 9 C), or one of intermediate type as in the drawing published by Professor Elliot Smith (Fig. 9 B)? Unfortunately several pieces of critical importance are missing from the middle of the skull-top and this has made possible the markedly different results of Smith Woodward and Keith. For if the remaining pieces of the skull-top are placed close together as by Dr. Woodward, the brain will be a very small one, estimated at 1070 cubic centimeters capacity, while if these same pieces be tilted upward and moved further apart as by Professor Keith, the brain capacity will be as large as in many modern men, namely 1500 cubic centimeters. The subject is an exceedingly difficult one, as the writer has learned to his cost, after long efforts to assemble the casts of the separate pieces in their natural positions. It may be briefly stated that the writer inclines to the reconstruction offered by Dr. Elliot Smith (Fig. 9, C) which avoids the extreme asymmetry of the opposite halves of the brain-case noticeable in Dr. Woodward's reconstruction, and gives more space at the top for the ends of the meningeal vessels. Dr. Elliot Smith has also discovered certain marks on the inner surface of the frontal bone which appear to settle the vexed question of the location of the median plane.

THE PILTDOWN MAN AS ONE OF THE
"MISSING LINKS"

As stated above, the temporal bone and its mastoid process, the back of the head and the whole brain-case, as well as the brain cast, are human in character, although of low type, while the lower jaw and dentition are prevalently simian. And while this regional distribution of human and simian characters was unexpected and in a way unprecedented, it means, as Professor Elliot Smith has noted, that the erect pose of the body, the freeing of the hands from locomotive functions, and the human development of the brain were associated in the Piltdown man

with a more conservative or simian structure of the dentition and jaw.

Whether or not the Piltdown man could talk is an open question. Dr. James Robinson has pointed out that in modern man the genioglossus muscle, the principal muscle of the tongue, is differentiated into many more or less separate strands, each with its own nerve supply and that this arrangement permits the extremely rapid and delicately coördinated movements of the tongue in speaking, whereas in the apes this muscle is much smaller and less differentiated. In modern man the muscle is attached to two little tubercles on the inner side of the chin, known as the genial tubercles (Fig. 6, *g. t.*). In the Piltdown

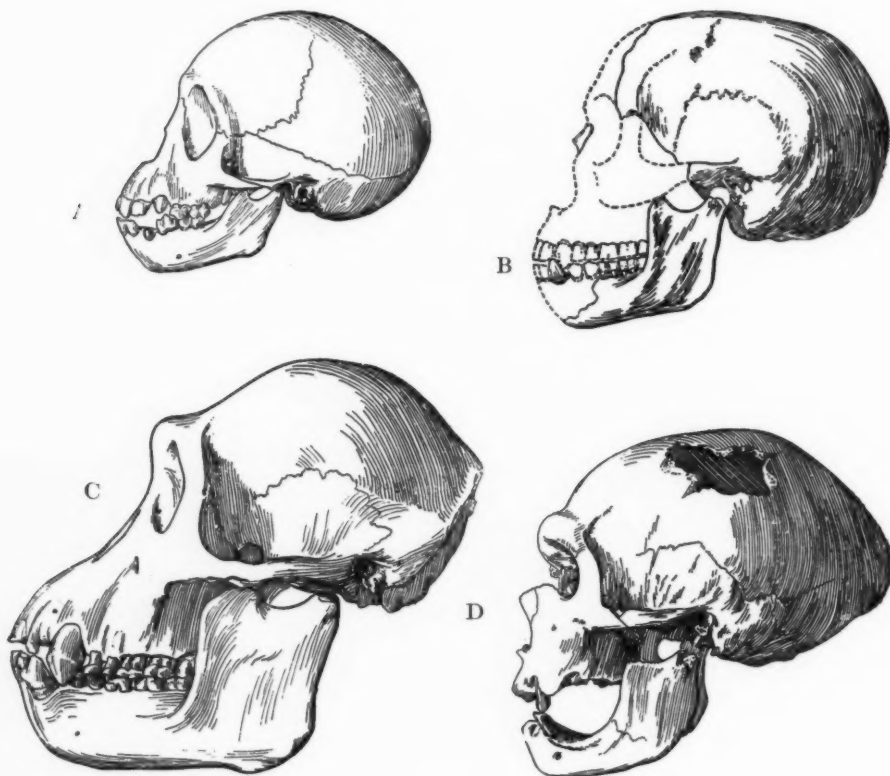


Fig. 10. A. Young chimpanzee skull
B. Piltdown skull
C. Adult male chimpanzee
D. The La-Chapelle-aux-Saints skull (Neanderthal race). After Smith Woodward

man, as in the apes, these tubercles are absent and the tongue rests below upon a shelf of bone. Nevertheless it may not therefore be assumed that the Piltdown man was entirely speechless. The brain cast shows in the temporal region (Fig. 8) an elliptical swelling (*T*) which foreshadows a certain greatly expanded center in the modern brain, a center "which recent clinical research leads us to associate with the power of spontaneous elaboration of speech and the ability to recall names" (Elliot Smith).

EVOLUTIONARY SIGNIFICANCE OF THE PILTDOWN RACE

Assuming that the jaw really belonged with the brain-case, Dr. Woodward very properly erected a new genus and species *Eoanthropus dawsoni* for the reception of this strange creature. He pointed out also that the rounded forehead with little or no brow ridges is characteristic of young apes (Fig. 10, *A*) while the flattened forehead with projecting brow ridges is characteristic of adult apes (Fig. 10, *C*) and also of the prehistoric Neanderthal race of man (Fig. 10, *D*); he therefore suggests that the still undiscovered mid-Tertiary apes which gave rise on the one hand to the various species of mankind and on the other to the existing anthropoids probably had rounded foreheads and a relatively short face.

Professor Keith's widely published but very questionable reconstruction showing the Piltdown man with a highly modernized brain-case has given opportunity to that part of the public which dislikes the idea of man's evolution from lower animals, to express the opinion that "the Darwinian theory is exploded." By palaeontologists and comparative anatomists however, the evidence for man's cousinship with the

anthropoid apes is regarded as no longer an hypothesis but an established fact.

The proof of the ascent of man from certain still undiscovered mid-Tertiary primitive apes does not rest largely upon the scant fossil remains of extinct races of men and of apes. It does rest upon the convergence of many lines of evidence offered by the embryology, anatomy and fossil history of numerous races of animals. To mention only a single line of evidence, the adult anatomy of man and of the anthropoid apes is extraordinarily similar not only in general plan throughout, but in thousands of minute details in every part of the body. By a detailed comparison of the skulls of man, anthropoid apes, and Old World monkeys and other mammals one sees directly that the human skull is merely a special modification of the primitive anthropoid type, with the brain-case larger, the face shorter, the dentition weaker; but everywhere the fundamental architecture is the same. For example consider the region of the under side of the temporal bone in man and in the anthropoids (Fig. 7); here are precisely homologous parts throughout, the same processes and ridges, the same canal for the internal carotid artery, the same styloid pit for the attachment of the hyoid bone and so forth. And so it is everywhere, throughout the skull and the entire skeleton, throughout the marvelously intricate architecture of the brain, spinal cord, and musculature, in all the vascular, respiratory, digestive and reproductive organs; so that no matter how long one continues the comparison, new similarities are constantly being revealed.

Palaeontologists and comparative anatomists likewise recognize and value the differences between men and apes. They realize that even the lowest existing races of mankind are extremely superior

to apes in mentality, in power of speech and in ability to use the hand as an organ of the will and intelligence. But they also believe that all these higher faculties, marvelous as they are, find their beginnings in the psychic and physical life of the apes, that the key to the mental and structural adaptations of mankind is to be found in the Primates alone among mammals.

Such being the general viewpoint of paleontologists and comparative anat-

mists, it need hardly be said that, to them, the Piltdown man, far from disproving the "Darwinian theory," is indeed a sort of "man in the making." He is one of the innumerable experiments made in Nature's vast laboratory, an early branch of the prehuman stock which had achieved a low human stage of brain and brain-case, but which in face and dentition still bore unmistakable traces of derivation from large-brained, primitive anthropoid apes.

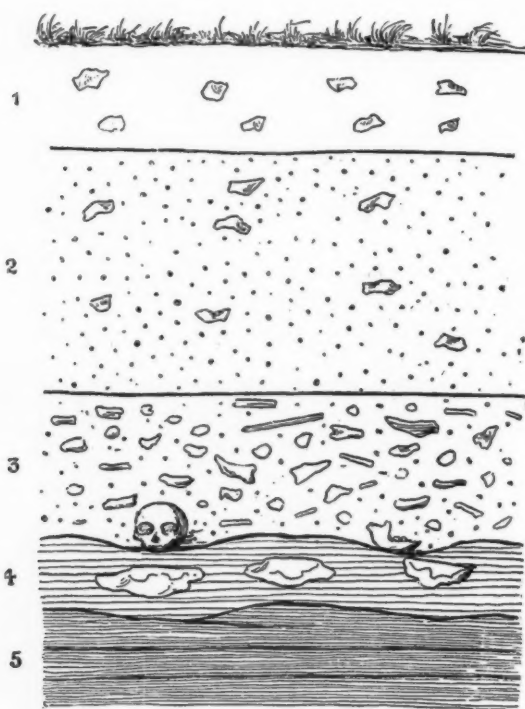


FIG. 11. Diagram of section of gravel-bed at Piltdown. After Dawson

1. Surface soil, with flints. Thickness = 1 foot
2. Pale-yellow sandy loam with gravel and flints. One Palaeolithic worked flint was found in the middle of this bed. Thickness = 2 feet, 6 inches
3. Dark-brown gravel, with flints, Pliocene rolled fossils and *Eoanthropus* remains, beaver tooth, "eoliths" and one worked flint. 18 inches
4. Pale yellow clay and sand. 8 inches
5. Undisturbed strata of Wealden age

COPPER DEPOSITS IN ARIZONA

WITH A BRIEF HISTORY OF THE MINING OPERATIONS IN THAT REGION
AND SPECIAL REFERENCE TO THE COPPER QUEEN MINING COMPANY

By James Douglas

Dr. James Douglas of the Copper Queen Consolidated Mining Company, who has such large field knowledge regarding the copper deposits of Arizona is a great benefactor of the American Museum and has shown his interest in the institution not only in financing but also in providing data and giving personal supervision to the construction of the most elaborate mine model in any of the world's museums. This model has been completed recently after three years of work on the part of experts and is on exhibition in the hall of geology. The detailed description of the model, written by Dr. E. O. Hovey, has been necessarily deferred until the next issue of the JOURNAL.—THE EDITOR.

UP to the year 1845 the production of copper in the United States came from the Appalachian Range. Comparatively small quantities were mined in North Carolina, Virginia, and Vermont. Subsequent to that date the statistics of production illustrate the shifting of the geographical centers of most active mining. In 1856 Michigan's proportion stood at ninety-one per cent of the total; by 1869 it had risen to ninety-five per cent, but in 1882 it dropped to sixty-two per cent; and since then it has steadily declined until now it occupies third place in the country's list of producing states—the first being Arizona, with thirty-three per cent of the total, second Montana, with twenty-three per cent, and Michigan third, with twelve per cent.

The sudden decline in the preëminence of the Lake Region of Michigan marks the entrance of the Rocky Mountain Region into the arena of the copper industry through the building of the transcontinental railroads. It was not until the Union and Central Pacific gave an outlet to the Butte mines over a long wagon haul to Corinne and until the Southern Pacific had reached Benson, Arizona, that these two prominent regions appeared almost simultaneously in the *Statistical Tables* as producers. The

first furnaces erected in Butte, at the Williams branch of the Argo Smelting Works, were the first shippers of rich argentiferous copper matte and the commencement of the steady flow of copper by rail from Arizona was in the fall of 1880. Previous to that, as early as the sixties, copper ore had been shipped from the Planet Mines via the Colorado River to California, and thence reshipped to England; but years before the Southern Pacific had traversed the territory of Arizona, Captain Wade, well known more than half a century ago as an enterprising steamboat man on the Lakes, had organized the Detroit Copper Company in the Clifton District of Arizona, but death forestalled his mining operations.

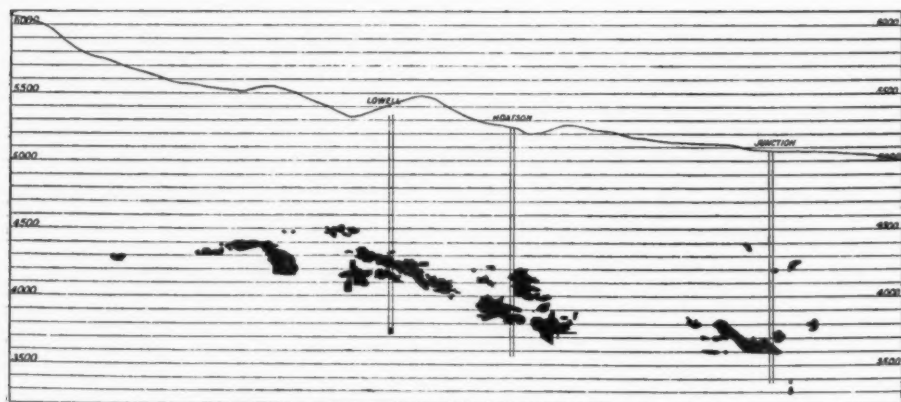
About the same time, in 1872, Messrs. Freudenthal and Leszynsky, a firm of merchants doing business on the Rio Grande, entered on a successful copper enterprise at Clifton under difficulties and dangers that would have deterred any but frontiersmen. The nearest railway station was about seven hundred miles distant in Kansas. Thither the bullion had to be transported by wagon, but as the smelters were also active importers, the bullion gave them return loads for some of their empty teams. Before 1874 they are reported to have

made eight hundred thousand pounds of copper, and even under such adverse conditions the annual output grew to a production of two million pounds in 1880. The mine which the Leszynskys attacked, was the Longfellow, yielding a very rich self-fluxing ore. The furnaces first erected were small reverberatories, built of brick, which are said to have cost a dollar apiece. These were abandoned and cupolas of the Mexican design were then erected, and the ore fused by charcoal hauled in from the Burro Mountains eighty miles distant. To increase the life of the furnaces metal plates lined the walls, and these were cooled with a spray of water. The next step was the erection of furnaces built entirely of large troughs cast from their own copper; and these primitive original prototypes of a water jacket were in use until 1883, when the Arizona Copper Company, a Scotch organization, acquired the Leszynsky plant and mines.

Meanwhile however, a much more important producer had sprung into existence. The Southern Pacific had reached Benson on the San Pedro River early in 1880. Sixty miles to the south-

east of Benson a claim called the "Halero" had attracted attention by a large outcrop of oxidized copper, iron and manganese ore. It was relocated as the "Copper Queen," and had attracted the attention of several mining engineers. There was however an invincible dread in the minds of the profession against sporadic ore bodies in limestone, and the claim fell into the lap of an eastern lawyer and a western railroad man, who were encouraged to buy it for a trifle. They erected a small thirty-six inch water-jacketed furnace near the outcrop. Their adviser and first manager was Mr. Lewis Williams, a practical Welch smelter. No mining equipment was required for over a year, for the large outcrop of pure rich ore sufficed to feed the miniature smelting establishment with a furnace mixture netting over twenty per cent copper, and yielding from the start more than ten tons of copper bars per day. In 1881 a second furnace was added, and from this small plant thirty-four million pounds of copper were made from the first ore body prior to 1885.

Although the Queen Company was the



Section transversely across the southern portion of the Bisbee-Warren district, Arizona, showing the vertical distribution of some of the bodies of ore

The disposition of ore bodies of the Arizona district is erratic. After a permanency of several hundred feet a mine may suddenly end blindly in limestone and the cost of finding another ore body may be greater than the cost of mining it after found

largest producer in the territory, all the districts which have since been active began contributing their quota. We have referred to the early activities at Clifton.

The United Verde deposits in northern Arizona had attracted attention before

even earlier than the Warren District; but neither Clifton nor Globe have been as prosperous as Bisbee, partly because of the highly silicious character of their ores. To render these ores fusible a large addition of fluxing material had to be added to the furnace charge, reducing



Map of claims showing the horizontal distribution of some of the proved bodies of ore. The Copper Queen Mine is represented in the upper left hand corner

actual mining was commenced at Bisbee. Ever since their development they have yielded an ore of exceptionally favorable smelting composition and richness. Another district, that of Globe, which is still prominent as a producer, had been discovered and superficially explored

proportionately the percentage of copper and involving a heavy loss of copper in the slags. Moreover, the Globe ores continue to be still deficient in sulphur, an element essential to economical smelting. On the other hand Bisbee had the advantage over its rivals in the South, of

a diversity of ores from which a favorable furnace mixture could always be made, and when matte smelting, with its cleaner slags and purer copper was introduced, Bisbee found itself with an unlimited supply of sulphur. At one time — but it was of short duration — Globe and Clifton could mine a richer grade of ore than Bisbee, which now enjoys the possession of a fusible ore of an average high grade of between five and six per cent.

The first period of the prosperity of the Copper Queen terminated abruptly in 1884, with the exhaustion of the first large ore body. Its apparent isolation after maintaining such permanency for four hundred feet, and its sudden termination in limestone, leaving no apparent clue to guide in the search for another ore body, was the first warning we had of the eccentric deposition of these copper deposits in their limestone nidus. They are confined to a series of about four hundred feet in thickness of the lower Carboniferous series and upper Devonian series, but owing to their erratic distribution, the cost of finding them often exceeds the cost of the actual extraction of the ore when found. By following certain trails blazed by the geologists along fault planes, exploration is now conducted with more certainty than formerly, but the horizontal maps of the ore bodies, as yet discovered, exhibit to the eye of the uninitiated that the search for ore bodies in this district is a more capricious task than in most mines.

Within these beds of ore-bearing limestone, decay has reached to a great depth. They have been partially explored for ore, by the Copper Queen and the Calumet and Arizona Mining Companies on their dip for a distance of a mile and a half from their outcrop; and at a vertical depth of eighteen hundred feet

from the surface, the ores are completely or partially oxidized, and the limestone and the intrusive porphyrites in which they occur are extensively decayed. Masses of unaltered pyritic ore are encountered in the Devonian and Silurian limestone, which underlie the Carboniferous, but those as yet discovered have not been large. It is estimated that in searching for ore and the development of known ore bodies, there have been driven by the Copper Queen Company two hundred and thirty-five miles of horizontal and vertical drifts and raises.

The disposition of the ore bodies being so erratic, more than the usual mining risks have occurred. At one time the fate of the district was in the balance. The summer after Queen commenced operations, Messrs. James and Dodge bought the Atlanta claim, which was parallel to the Copper Queen, and toward which the ore body of the Copper Queen was dipping. Four years were expended in drifting, running tunnels and following stringers of ore from the surface, which ended in nothing. Meanwhile the Copper Queen ore body had ended abruptly, before reaching the Atlanta side line. The only other company, the Neptune, had exhausted both its capital and credit, and had abandoned work; and therefore, for a period dark clouds of despondency overhung the district.

But almost simultaneously, after the Copper Queen had driven an exploratory drift in barren limestone for five hundred feet, and the Atlanta Mining Company after four years of disappointment was in despair, both companies struck the same new ore body. Instead of quarreling as to ownership, under the law of the apex, they decided to unite. The Atlanta Mining Company merged itself into the Copper Queen, reappearing in

the word "Consolidated." In fact however the Copper Queen proved to have been worked out, and the Atlanta alone supplied the ore for years which restored the Consolidated Company to prosperity and fame.

The copper industry was passing through the most trying period of its existence. The price of standard copper bars (of ninety-six per cent) had dropped from eighteen cents to a trifle under eight cents per pound, Lake copper standing as low as ten cents. Dividends failed to be paid during 1885, 1886 and 1887, the only blanks in the dividend record of the Company. To make cheaper copper, better appliances had to be introduced. A new smelter was erected and despite low prices, a fraction of a cent per pound was made—when M. Sacrétan unintentionally sacrificed himself and his bank for the good of the copper world. After that, as years rolled by, the Company acquired adjacent property and enlarged the capacity of its furnaces. Meanwhile the character of the ores changed in depth. The presence of sulphur in the furnace charge resulted in the production of matte, as well as copper. This involved a radical alteration in the metallurgical methods and the design of the smelter. Bessemer converters were added to the plant. Although the conversion of all the copper into matte involved a slight extra smelting cost, by making cleaner slags a saving of more than one per cent in the furnace returns was made. Moreover the bars produced carried ninety-nine per cent of copper and over, instead of ninety-six per cent.

As a result of the greater purity of the bars, the cost of refining by electrolysis was reduced to a figure that made it profitable to pay the refiner the slight excess over the old furnace method and

recover the precious metals. Since 1896 all the copper has been refined electrolytically, and has saved seventy or eighty cents in gold and silver per ton of ore. It is a trifle per ton, but amounts at present to an aggregate of \$865,000 per annum from the Company's ores alone.

The second works, erected in the cramped valley around which the town of Bisbee had grown up, could not be expanded to meet the growth of the Company's production, and therefore toward the close of the century, it was recognized that a new smelter in a new locality must be built.

As early as 1887 a railroad of thirty-nine miles was built by the Company to connect with the Santa Fé Railroad's Sonora System at Fairbanks. Its tracks were extended for twenty-eight miles easterly to Douglas, a junction point of a Mexican railroad built to meet the requirements of a mineral region which had been developed at Nacozari, seventy miles south of the international boundary line. At this junction point in the Sulphur Spring Valley, suitable sites were selected for two smelting plants of large size, which were planned by the Copper Queen Company and the Calumet and Arizona Mining Company. This latter vigorous organization had entered the district in 1898, and has aided in the development of its resources. The two mining companies agreed to coöperate rather than to litigate, and the method has so far worked successfully.

The large reduction works at Douglas, Arizona, were planned to smelt in cupola furnaces about fifteen hundred tons of ore per day. But they have grown in size and in complexity of methods, until now there are treated daily twenty-five hundred tons of ore in the cupolas and

five hundred tons of concentrates from Nacozari and flue dust in reverberatories.

A table of production and of dividends gives in brief the history of the enterprise's success since its organization.

COPPER QUEEN CONSOLIDATED MINING CO., FROM THE YEAR 1887

COPPER QUEEN MINING CO., PREVIOUS TO 1887

YEAR	MINING CLAIMS ACQUIRED.		Lbs. Copper Produced	DIVIDENDS PAID Amount	REMARKS
	Claims	Acres			
1881	2	26.08	34,536,000	1,350,000	Under Messrs. Martin & Ballard and original Copper Queen Mining Co.
1882	—	—			
1883	—	—			
1884	1	0.473	6,721,535	—	Under Copper Queen Consolidated Mining Co. Developing mines and rebuilding smelting works
1885	3	37.99			
1886	—	—			
1887	16	188.734	5,945,550	—	Enlarged smelting works and better prices paid for copper by M. Secrétan during 1888 and 1889
1888	5	59.107	9,379,949	140,000	
1889	1	10.77	9,408,000	105,000	
1890	1	11.56	9,031,680	210,000	Large accessions of property by acquiring the Holbrook & Cave Co.'s mine, the Neptune Co., and other claims. The Bisbee smelter was enlarged to an extent limited by the size of the site on which the works were located up to the date of their removal from Bisbee to Douglas.
1891	3	23.19	10,203,683	420,000	
1892	28	234.353	9,806,764	385,000	
1893	6	55.685	13,795,618	300,000	The production of the Douglas smelter
1894	—	—	12,688,372	200,000	
1895	—	—	15,741,731	250,000	
1896	—	—	23,298,150	400,000	
1897	—	—	23,999,873	700,000	
1898	2	0.708	33,749,390	1,000,000	
1899	2	0.872	36,901,684	2,000,000	
1900	6	54.722	34,382,309	2,800,000	
1901	35	430.485	39,781,333	3,150,000	
1902	10	196.21	35,831,755	800,000	
1903	7	120.168	36,939,800	800,000	
1904	—	—	61,225,522	800,000	
1905	—	—	76,791,981	2,300,000	
1906	—	—	79,807,461	6,500,000	
1907	—	—	62,502,961	3,800,000	
1908	—	—	81,986,236	3,000,000	
1909	—	—	75,869,405	4,025,000	
1910	—	—	71,928,357	6,300,000	
1911	45	727.494	75,203,813	5,200,000	

ANCIENT POTTERY FROM NASCA, PERU

By Charles W. Mead

The Nasca Collection of pottery, featherwork, textiles and other objects has been purchased and presented to the Museum by Mr. A. D. Juilliard

THE Museum has recently had the rare good fortune to secure in a collection from prehistoric graves in Nasca, Peru, some four hundred and twelve examples of pottery. Nazca pottery is undoubtedly the most beautiful ware so far discovered in South America, which is saying much in view of the thousands of remarkable pieces that have been brought to light in various localities, especially along the Peruvian coast and in the high plateau region about Lake Titicaca. The pottery from Nasca is a thin ware showing a high degree of skill in the firing, but its claim to preëminence lies in the beauty of its painted decorations. The designs are mostly derived from the same motives as those found on Pachacamac pottery of the so-called "Tiahuanaco" style, but are much more highly elaborated. Many different colors and tints are employed, and the color schemes are worked out in a truly artistic manner.

The credit of bringing this unique pottery to light is due to Dr. Max Uhle. In a short account of his discovery of the Necropolis of Nasca in 1901 (*Proceedings Davenport [Iowa] Academy of Sciences*, vol. xiii, 1-46) he tells us that he had previously seen in the Berlin *Museum für Völkerkunde* a group of four polychrome vessels of an unknown type. They had come into the possession of the Museum in the seventies, labeled as coming from Ica and Chala. Nothing resembling them had been seen and as the region around these localities was unknown to archæologists, but little importance was

attached to the original labels. Dr. Uhle says, "I still recollect the enthusiasm with which the late Adolf Bastian, the founder of the *Museum für Völkerkunde*, extolled these few strange and wonderful objects, the like of which never had been seen before as coming from Peru."

Dr. Uhle states that it was largely owing to the inspiration of Professor Bastian that he "determined to study the question as to the provenience and cultural significance of this type of polychrome ware," of which he had seen these few specimens in Berlin.

The second Hearst expedition to Peru, under the auspices of the University of California, furnished Dr. Uhle the desired opportunity of searching for the mysterious hiding place. He arrived in the department of Ica in November, 1900, and having purchased riding mules, immediately set out on his quest.

It was in the month of January, 1901, while visiting at the hacienda Ocucaje, twenty-five miles south of Ica, that he realized the object of his search; but let him give an account of his discovery in his own words. He says, "After having made a number of minor excavations with the same negative results as all the former attempts, I was riding one day around a sandy edge of the valley when my eye was arrested by a simple potsherd lying upon the ground. It proved to be a fragment of a large bowl, quite undecorated but for a band of red coloring along the upper rim. My attention was thereby roused at once. Only

in objects of the Tiahuanaco period had I so far found this characteristic feature. I decided to dig in this place. Quickly the necessary workmen were brought together and a donkey was set to work to carry all day long the supply of drinking water from a spot three miles away where water was to be found in the river bed at about three feet below ground. The first day's work proved that the long sought cemetery had, at last, been found and that the beautiful polychrome ware had been located."

Archæologists recognize four principal types in the immense variety of prehistoric Peruvian pottery: that of Tiahuanaco; the Inca type on the shores of Lake Titicaca, with its classical forms; that of the region of Trujillo, and the Nasca style with its polychrome decorations. These four different types would seem to mark periods of the highest cultural development in Peru in prehistoric times.

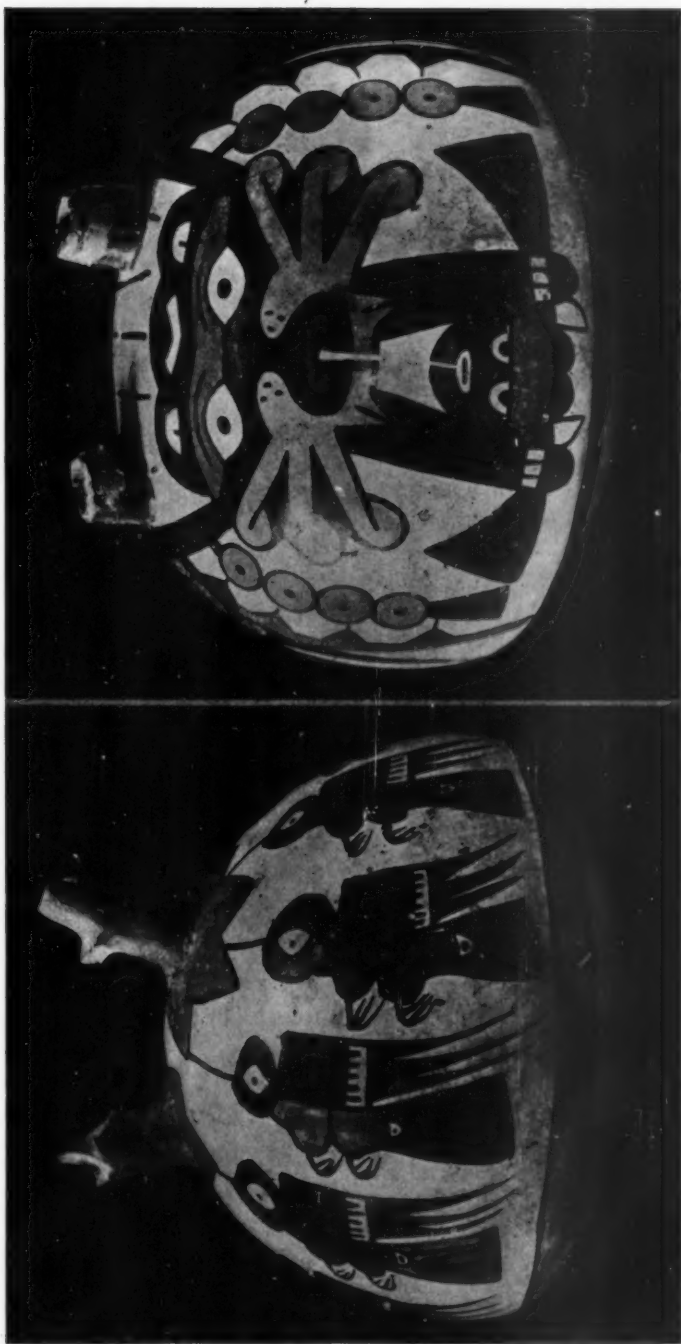
What has ever been a mystery in the study of the archæology of southern Peru is the fact that so many of the seats of culture are found to be in arid valleys where there is little or no running water, surrounded by extensive deserts. In many such situations there must have been a dense population as evinced by the vast cemeteries. There do not seem to be any known facts to support the theory that the climate has undergone any great change. Why were such localities selected and how was it possible that means of support could be found for a large body of people under such unfavorable conditions? Although the vicinity of Nasca does not appear to have been one of the densely populated districts, the

conditions were the same as others just described.

Nasca lies about two hundred and twenty miles to the south of Lima and fifty miles inland from the Pacific coast. The region is extremely hot and dry, and the soil is mostly sand strongly impregnated with nitre. About the only native forms of vegetation to be seen are algaroba trees and the indigenous cotton bush.

The graves are usually from six to ten feet deep in the sand. The body, clothed in a poncho and wrapped about with various pieces of cloth, was placed in a sitting posture. Commonly two or more vessels of this beautiful polychrome ware, and various articles that had belonged to the deceased, were placed beside the body in the grave; sticks of algaroba wood were laid over the "mummy," and the pit filled in with sand. Infants were buried in large earthen jars. Objects of gold have been found in these graves, but up to the present time no implements of copper or bronze have been discovered.

The colors used in decorating Nasca pottery were white, yellowish white, yellow, red, orange red, pink, deep red, brown, light blue, blue, violet, gray and black. As in other parts of Peru, the decorative motives are largely drawn from the human figure, birds, fish, the great cats, mythological monsters which are usually a combination of human and animal figures, and geometrical designs derived from the textile art. The accompanying illustrations show forms and decorative designs, but of course give no idea of the colors which are the chief charm of these ancient water vessels.



Presented to the Museum by A. D. Juilliard

NASCA POTTERY

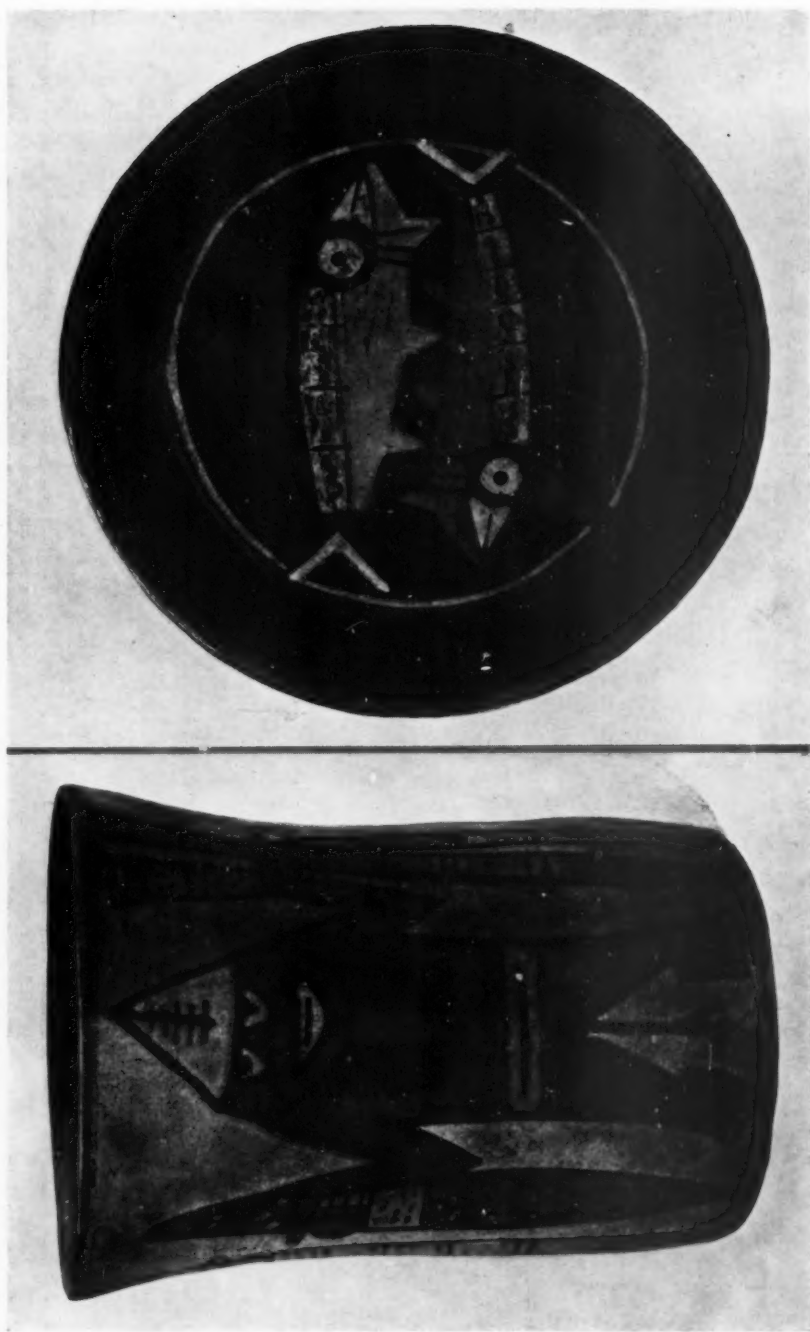
The Nasca pottery vessels (some 412 in number) discovered in prehistoric graves, is the most beautiful in color and decorative design of any yet found in South America. Figure 1 shows highly conventionalized humming birds extracting honey from starlike flowers. Figure 2 is a vessel with a mythological figure wearing a face mask



Presented to the Museum by A. D. Juilliard

EXAMPLES OF NASCA POTTERY

Figure 1 shows a bird resting on a gourd vessel. Figure 2 is a drinking cup with representation of a warrior carrying darts and a feathered staff; below are two rows of human faces with facial decoration



Presented to the Museum by A. D. Juilliard

NASCA POTTERY VESSELS

Figure 1 is a vessel of relatively crude design. It shows a warrior wearing a curious laced cap and a breechcloth with string and tassel hanging from the back. Figure 2 shows a saucer-shaped vessel, decorated inside with figures of two horse-mackerel.



Presented to the Museum by A. D. Juilliard

TWO INTERESTING PIECES OF NASCA POTTERY

The first shows a seated figure holding some kind of vegetable or fruit in each hand. A white band extends from the mouth to the bottom of the vessel and upon this are painted numerous representations of the crawfish and herring. This piece of pottery is especially beautiful in coloring. Figure 2 has a representation on the upper surface of a person holding sprigs of a plant, probably the sacred coca leaves

THE CROCKER LAND EXPEDITION

LETTERS arrived late in May from various members of the Crocker Land expedition, brought to civilization by Knud Rasmussen, the Danish explorer. The Crocker Land expedition under the leadership of Donald B. MacMillan left New York on July 2 for three years of exploration work over the ice cap of Greenland and northwest from Cape Thomas Hubbard to investigate the land which Peary reported that he saw over the sea ice and named Crocker Land. Until these letters came, the Museum had received no word from the expedition since a report sent to New York on August 30, 1913, when the expedition was making preparations to winter at Etah, the site of Peary's former camp. In fact considerable disappointment has been felt at not receiving frequent news as the expedition carried wireless and there had been hope of continual communication. It now appears that the lack of result with wireless has been due probably to two reasons: that the location of the expedition's winter quarters at Etah has been unsuitable to give a proper lead for their aerial and that the instruments carried are not of sufficient power without the intermediate station at Cape Wolstenholme, Hudson Bay, which was to be established by the Canadian government.

When the letters were written the expedition's difficult work had not yet been undertaken. The men had been snugly ensconced at Etah in a commodious well-heated house constructed of lumber carried for the purpose. The house is equipped with electric lights within and without. There had been plenty of the food of civilization. With youth, health and what had proved congenial comradeship, they had worked in and about this "palace," as they

named it, making only relatively short excursions to hunt and to cache supplies at Anoritok twenty-five miles north and at the entrance of Buchanan Bay across Smith Sound on Ellesmere Land, although Ekblaw had made the longer journey to Cape Melville to view a meteorite purchased by Rasmussen from the Eskimo. Their letters are filled with enthusiasm for the four hundred-mile journey planned for the spring over Ellesmere Land and Grant Land and an additional one hundred and twenty-five miles of sea ice to the new land. The following quotations give somewhat the story of the months since they reached Etah:

EXTRACTS FROM LETTER FROM DONALD B. MACMILLAN, LEADER OF THE EXPEDITION, TO HENRY FAIRFIELD OSBORN, PRESIDENT OF THE AMERICAN MUSEUM, WRITTEN AT ETAH, NORTH GREENLAND, JANUARY 10, 1914

The midnight of the long Arctic night is over with every one in good health and eager for the big work ahead of us. Apparently the darkness and absence of the sun has had no effect at all upon the boys; they are just as happy as ever and singing most of the time. Ekblaw is now on a trip with dog team to the shores of Melville Bay to obtain if possible a piece of a large meteorite found by Koodlooktoo. We should make every effort to secure all of it if the Eskimo boy had not sold it to the Danes. It is undoubtedly part of the same fall from which came "Ahnighito" and the others secured by Peary in 1896 and 1897....

The day after the ship left us we began excavating with picks and dynamite for our house, selecting a well sheltered spot in the midst of the Eskimo igloos. The work went on day and night and on

September 12 we moved into a large, comfortable home 34 by 34, eight rooms on the ground floor and a large attic for a store room. To this we added as a protection from the cold and for quarters for our dog-drivers a shed eight feet wide on two sides. I am quite sure we have the most palatial residence ever put up in the Arctic with our electric lights and with telephone to two Eskimo igloos. We have tried to make the boys just as comfortable as possible as an inducement to good work, giving them good warm rooms and good warm clothing.

...I have succeeded in establishing two provision stations on the line of march to Crocker Land, one at Anoritok, about twenty-five miles north of here and the other across Smith Sound over in Ellesmere Land at the entrance of Buchanan Bay. The boys crossed over last month by moonlight getting five polar bears on the way. This moon our dog-drivers are all hunting walrus, hoping to give our dogs plenty of meat so as to keep them strong for the hard work to come.

...We have over a thousand miles to go in a temperature ranging from thirty degrees to seventy degrees below, and such an undertaking cannot be accomplished without hardship and suffering and loss of dogs. The evil spirit of the Arctic is always watching and can change success into misfortune and failure within a few hours. One month ago the boys with their dog-drivers had no trouble at all in getting to Anoritok. This month when the ice conditions should be better we were blocked by open water almost within sight of the house. Such is the uncertainty of one's work here.

When we left home Allen and Green were quite sure that we should be able to communicate with you by wireless whenever we liked. They have tried,

have worked like Trojans, have listened attentively but not a tick or a buzz have we heard, which is a great disappointment to the Museum and our friends. In the spring we shall try kites to support the aerial and keep trying as long as we are here, hoping that conditions may be right at some time to catch us.

We shall leave the house here for Crocker Land about February 10 with twenty-one men and one hundred and sixty dogs and shall remain on the other side just as long as we possibly can. If cut off by open water in Smith Sound we can easily subsist on game found in the region, crossing over when ice forms late in the fall.

EXTRACTS FROM LETTERS FROM FITZHUGH GREEN TO HIS FATHER AND MOTHER DATED JANUARY 11 AND 24, 1914, WRITTEN AT ETAH, NORTH GREENLAND

Our plans for the spring trip are complete. I leave two weeks from to-day, when the moon is up and increasing daylight permits traveling...

The white men do not travel together. We cannot take tents and shall depend on the natives for our snow shelters. We are taking tea, biscuit and pemmican for eighty days but do not expect to be back until June, depending on game for food later...We can take only the clothes in which we walk, spare foot gear, an extra shirt and a sleeping bag.

I know that you care not the snap of your fingers whether we find Crocker Land or not. I realize that I must come back to you. But even that cannot change the everlasting desire inside of me, the passion to travel, to fight the cold, and the wind and the nights, to be hungry and kill game. Unless the Devil himself gets into my luck and lays me up early with a frozen foot or the like

I am going to have the time of my life on that trip. The only thing that can prevent it will be the tender bringing up I had in the South, which the Eskimo had the luck to miss.

Just now the wind is trying to blow the house down. That seems to be the daily task it sets itself, but it only makes the stove draw better.

The hills are silent, there is no answer to my footstep from the great white plains. I walk and walk! Cold? No! the thermometer says it is bitter cold but the glass tube is a plaything of the South — it lies! My hands are bare — from one dangles my mittens wet with sweat, in the other is my whip with which I clip little dents in the snow around me. The whip is about twenty-five feet long and it cracks like a pistol in the crisp air. Over my head circles a great round moon, brighter than any you ever saw. Round and round she goes, rolling lazily along; underfoot the road is miles wide and leagues long, whiter than the whitest marble it stretches away into the dreams that come. I seem to weigh nothing; my muscles are steel springs; I laugh aloud! I throw back the hood of my *koolitah* — its fox tail roll keeps my face warm but I tire of it. I listen, not a breath — not a movement in the miles and miles that lie before my eyes. Even the mist over the ice cap hangs sleeping on the white breast beneath.

... Last month Ekblaw and I laid our food supplies up to the coast and over in Ellesmere Land for the spring trip that starts in February, as soon as it gets light enough to travel in the day time. We each had our divisions of Eskimo but kept in touch with each other. On the last trip that ended just before Christmas we got five bears. I shot one of them. Now I have bearskin pants, mittens, and trimmings of bearskin on all of my fur clothes.

We had temperature below 50° below zero and had a bad gale with the bitter weather. Even the Eskimo frosted their faces. But I have become so used to freezing my face that it is no more than sunburn at home.... We got all turned around and were traveling in the night and sleeping in the daytime by the time we reached home. I could write all night about things but will tell you some day. All I have to say is that I hope the ship gets wrecked on her way up to take us back so that we can stay another year. I guess the Lord made me an Eskimo and then forgot and sent me to you instead of to Panikpah or the like.

The Eskimo are an ideal crowd. They are good-natured, unselfish and everlastingly good fun. The children have white children beaten a mile. I have a regular nursery in my room and never feel at home unless I stumble over two or three when I am trying to find my clothes or writing material.

EXTRACTS FROM LETTER WRITTEN JANUARY 9
AT ETAH BY DR. HARRISON J. HUNT

Last moon I went to North Star Bay to see some sick people, and visited all the Eskimo settlements on the way home. They are eager to go with us. This tribe needs a doctor to reside with them. A small lying-in hospital would increase the population at once as the death rate among infants and mothers is very high. With about forty thousand dollars behind me I would like to undertake the task.

The colony at Etah shot about fifty caribou this fall. Seals are plenty and large Arctic rabbits, one of which I shot to-day weighing nine pounds, and there are bear and fox, to say nothing of the ducks of which we have eaten a great many.

... The Eskimo are with us all the time,

make our skin clothes and eat our food in return. They are a clean lot and as honest as the day is long. Nothing is ever taken although things are left about under their noses all the time....

EXTRACTS FROM LETTER WRITTEN BY W. ELMER EKBLAW, NORTH STAR BAY, NORTH GREENLAND, JANUARY 16, 1914

....I am writing this letter at the polar cabin of Herr Knud Rasmussen at this place, on my return trip from Cape Melville whither I went with him to examine a great meteorite near there. He has purchased it from Koodlooktoo, the Eskimo who found it for the museum of the University of Copenhagen. I am making as careful a report as my facilities permit to be sent to the king of Denmark, secure in the conviction that you will fully approve my thus taking upon myself the responsibility for an action which I deem but an international courtesy and scientific duty....

We are all in good health, quite enthusiastic despite our failure to get the wireless messages through, and except for the fact that our dogs are not in condition, well ready for the coming dash to Crocker Land...

My 300-mile journey to Cape Melville and return during this midwinter moon has been fraught with much adventure, much interesting and novel experience, and all the scientific observation I could make by moonlight and the waxing mid-day twilight. It is a journey I should like very much to make by daylight, for the geological phenomena of interest to science are numerous and varied and would richly reward the investigator. I wish I might stay here five years instead of three, for even so, I should be busy every possible moment on the problems I have already encountered. There is great work to be done here by some

enthusiast, particularly in geology and botany. I feel sure that in the Pre-Cambrian formations and in the glacial phenomena, results could be obtained that would throw much light on the geology of all North America...

Herr Knud Rasmussen has shown me every courtesy. I feel he is a man worthy of your personal attention to which I commend him should he ever come to New York. He is a gentleman, a capable and trained explorer and a carefully educated ethnologist.

LETTER WRITTEN BY DONALD B. MACMILLAN
AT ETAH, JANUARY 21, 1914

Ekblaw is just in from Melville Bay... Rasmussen is most kind and offers to help us in every way possible. He had plans for an attack on Crocker Land this year but most generously gave them up when he read of our intentions.

We have only three weeks now before leaving on the long trip. Eighteen sledges will leave here from February 7 to 9 loaded with about 9000 pounds of food and equipment. Four sledges will probably return from the head of Beitstad Fiord; others will go on to Cape Thomas Hubbard. From here I am planning to send Dr. Hunt south to run in unexplored coastline and Tanquary north. Ekblaw, Green and myself with eight Eskimo will head out northwest over the Polar Sea. When leaving Etah we shall have food for eighty days. This, I hope, will put us on the shores of Crocker Land and back to Cape Thomas Hubbard. For the 300-mile trip home we shall depend upon the game of the country, remaining in Ellesmere Land just as long as we possibly can.... Naturally I am very much disappointed over the failure of our wireless. Possibly the big station in Hudson Bay has not been installed so you may hear from us yet.

MUSEUM NOTES

SINCE the last issue of the JOURNAL the following persons have become members of the Museum:

Founder, Hon. Joseph H. Choate;

Associate Founders, MESSRS. CLEVELAND H. DODGE, ARCHER M. HUNTINGTON, ARTHUR CURTISS JAMES, CHARLES LANIER, OGDEN MILLS, PERCY R. PYNE and WILLIAM ROCKEFELLER;

Life Members, MRS. ROBERT STEWART, MISS KATHARINE DUBOIS and MR. J. K. ROBINSON;

Sustaining Member, MRS. ROBERT STEWART;

Annual Members, MRS. FRANCIS C. BARLOW, MRS. H. B. GOLDSMITH, MRS. J. M. HUBER, MRS. EUGENE LEWIS, MRS. THOMAS P. MCKENNA, DR. ROBERT ABBE, PROF. WESLEY C. MITCHELL, REV. J. FREDERICK TALCOTT and MESSRS. SAMUEL FRANK, MOE JACOB, WILLIAM KRONE, WILLIAM SIEGEL, DAVID SHEARMAN TABER, JR., FERDINAND WEBER and JOSEPH WITTMANN.

THE zoölogical collections which, through the generosity of Colonel Roosevelt, the Museum has received from the Roosevelt expedition to South America, amount to twenty-five hundred birds and four hundred and fifty mammals.

Work was begun by George K. Cherrie and Leo E. Miller, whom Colonel Roosevelt took with him as representatives of the Museum, in the vicinity of Asuncion, Paraguay, in the early part of November. The next collecting station was in the vicinity of Curumbá. From this point, the expedition proceeded northward through San Luiz de Cáceres to Utiarity and Tapirapoan.

At Utiarity Mr. Anthony Fiala, "chief of commissary," started with Lieutenant Laurido Sta. Anna, and six natives, down the Papagaio, Juruena and Tapajoz Rivers at Santarem. The expedition continued its five-hundred-mile overland ride to the Rio da Dúvida. From here Mr. Miller with Second Lieutenant Joaquim Manuel Vieira de Mello, Euzebio Paulo de Oliveira, and Heinrich Reinisch, representatives of the Brazilian Government, went overland three days, then down the Gy Paraná and Madeira Rivers and up the Negro to Manaos.

On February 27, the main party, consisting of Colonel Roosevelt, Colonel Rondon,

Lieutenant Lyra and Doctor Cajazeira, of the Brazilian Army, Kermit Roosevelt, George K. Cherrie and fifteen canoemen, started on what proved to be a perilous voyage down the hitherto unexplored Rio da Dúvida, which was ascertained to flow into the Madeira. The difficulties of transportation were so great that comparatively few specimens were collected by Mr. Cherrie on this trip. Those which he did obtain, however, proved to be of exceptional interest.

Mr. Miller made an important addition to the collection at Calama, at the junction of the Gy Paraná and Madeira, and also at Manaos, which he reached several weeks in advance of Colonel Roosevelt's party.

THE Library has just received as a gift from Mr. Anson W. Hard a number of rare and valuable works. *Die Infusionsthierchen als vollkommene Organismen und Mikrogeologie* by D. C. G. Ehrenberg, who made the first serious investigations of micro-organisms by the aid of the microscope, are noteworthy additions to the Library. *Trees of Great Britain and Ireland* by Henry John Elwes, privately printed in seven volumes with magnificent plates, will be appreciated by all tree lovers and students of forestry. Of hardly less note are *Delectus animalium articulorum* by Spix and Martius, *Voyage pittoresque et historique au Brésil* by J. B. Debret and *Voyage to New Guinea and the Moluccas from Balam-bangan* by Thomas Forrest.

At a recent meeting of the Board of Trustees the constitution of the Museum was amended so that the incorporators of the institution should be designated as Founders of the Museum, and was further amended to create a class of members to be designated as Associate Founders. All persons contributing \$25,000 in cash, securities or property to the funds of the Museum are eligible for election to this class.

THE Academy of Natural Science of Philadelphia has conferred the Hayden Memorial Medal for the year 1914 upon Professor Henry Fairfield Osborn in recognition of his contributions to the science of vertebrate palæontology.

COLONEL THEODORE ROOSEVELT has arranged to give to members of the American



Members of the Roosevelt expedition to South America. At the left of Theodore Roosevelt, Father Zahm, George K. Cherrie, representative of the American Museum and Anthony Fiala, chief of commissary; at the right, Kermit Roosevelt, Frank Harper and Leo E. Miller, representative of the American Museum

Museum in the fall the first presentation of the zoological results of his recent expedition to South America.

Two expeditions from the department of vertebrate palaeontology will be sent out this summer in search of fossils. The first expedition in charge of Mr. Barnum Brown, assisted by Mr. P. C. Kaisen, will confine its operations to the Red Deer River of Alberta, Canada, where it will endeavor to collect Cretaceous dinosaurs, and the second in charge of Mr. Albert Thomson will go to the big quarry at Agate, Nebraska, to secure additional *Moropus* skeletons.

MR. JOHN A. GROSSBECK, a patron of the Museum and a member of the department of invertebrate zoölogy, died in Barbados on April 8. Although Mr. Grossbeck was taken ill more than a year ago, his health seemed to be partially recovered, and in order to regain his strength he was touring the Caribbean region with his brother when he died suddenly during a change of boats.

Mr. Grossbeck came to the Museum about four years ago, having previously been connected with the New Jersey State Experiment Station. While in that institution he made valuable discoveries concerning a wide range

of injurious insects but especially concerning the life history of mosquitoes. His chief scientific interest however was in the Geometridæ—the family of moths whose young are the “measuring worms.” On coming to the Museum Mr. Grossbeck gave to it his valuable collection of this group as well as his general collection of local insects. In recognition of his generosity he was made a patron. Mr. Grossbeck devoted himself to the work on insects with untiring zeal and by reason of his broad entomological training was able to further the work in all of its branches. He had already made an international reputation in entomology and it will be exceedingly difficult for the Museum to find a successor who will combine Mr. Grossbeck’s willingness to serve with an equal entomological knowledge.

THE Museum wishes to express its sincere sympathy to the bereaved families of two of its workers, William A. Dolan and Christian Hundertpfund of the mechanical staff, who had served the institution faithfully for thirteen and twelve years respectively.

THE publicity committee of the Museum, created during the winter, has been endeavoring to acquaint the people in New York City

with the Museum's exhibits and activities. Sixty thousand folders have been printed and placed in the hotels and steamboats and a number of large framed posters have been put in conspicuous places throughout the city.

THE department of public education of the American Museum is sending photographs and explanatory labels illustrating its work among the blind in New York City, to the Exhibition of the Arts and Industries of the Blind held in connection with the International Conference on the Blind which occurs in London from June 18 to 24.

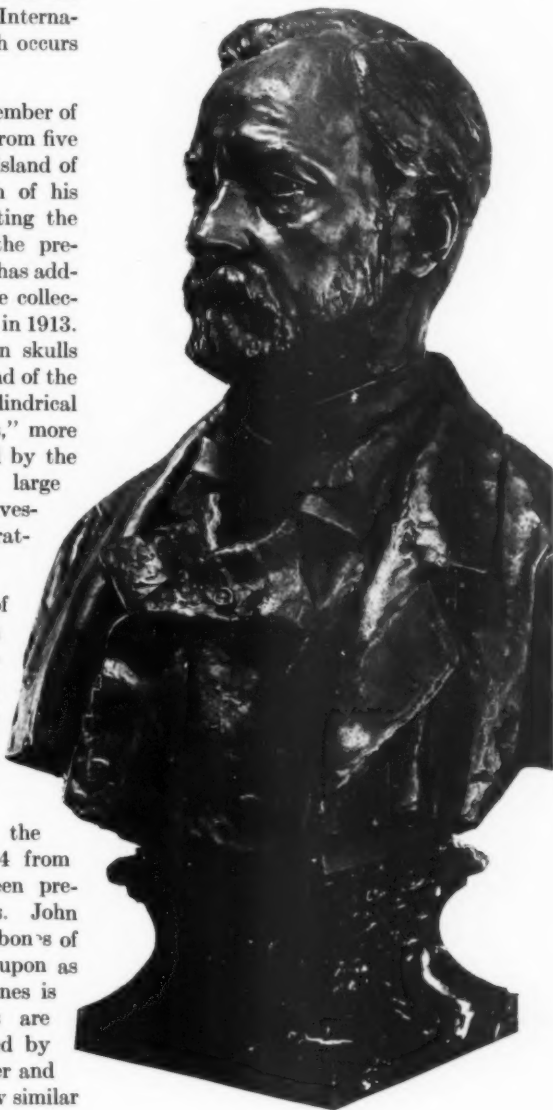
MR. GEORGE C. LONGLEY, a life member of the Museum, has recently returned from five months' archaeological study on the island of Jamaica. Mr. Longley spent much of his time while at the island in excavating the kitchen middens of the Arawak, the prehistoric inhabitants of Jamaica. He has added the results of his researches to the collection presented by him to the Museum in 1913. The additions consist of two human skulls found in a cave in the northeastern end of the island, a stone idol, two perforated cylindrical stones, usually called "chief's stones," more than one hundred stone axes (called by the natives "thunder balls"), and a large number of pieces of broken pottery vessels which show the manner of decorating by incised lines and dots.

A replica of the famous bust of Louis Pasteur by Dubois has been presented to the Museum for installation in the hall of public health, through the generosity of Dr. Roux, Director of the Pasteur Institute in Paris and M. Vallery-Radot, son-in-law of M. Pasteur.

A TIBET apron obtained by the Younghusband expedition of 1903-4 from the largest temple at Lhasa has been presented to the Museum by Mrs. John Magee. This apron is made of the bones of saints or holy men and is looked upon as very sacred. The carving on the bones is unusually beautiful. Such aprons are worn in order that the virtue possessed by the bones may pass into the wearer and he may thus acquire holiness. Few similar examples have as yet found their way to museums. This specimen was exhibited to Museum members for the first time on the evening of May 6 when Sir Francis Edward

Younghusband lectured on "Tibet and the Entrance to Lhasa."

MR. JAMES BARNES of the Barnes-Kearton expedition, which crossed Central Africa under the auspices of the American Museum, has returned to New York bringing with him a splendid series of motion-picture films. Mr. Barnes will give an exhibition of these films to the members of the Museum in the fall.



Bust of Pasteur presented to the Museum by Dr. Roux and M. Vallery-Radot

THE model of the Copper Queen Mine (the full description of which by Dr. E. O. Hovey has been necessarily deferred until the next issue of the JOURNAL) is supplemented by a collection of specimens illustrating the mineralogy of the region about Bisbee, Arizona, another series illustrating the commercial ores of the mines, sets of rock specimens giving the economic and general geology of Bisbee, still other samples showing the smelter treatment of the ores at Douglas, accompanied by photographs of mines, surrounding country and the smelter. Some of the specimens deserve special mention, particularly the group of velvet malachites whose surface is composed of delicate needle-like crystals. A geode-like mass of smooth botryoidal malachite attracts much attention. The great prism of ore, about three feet square by five feet high and weighing about three and one-half tons, occupying a special case, was raised through the Czar shaft of the Copper Queen Mines and exhibited first at the Columbian Exposition, Chicago, in 1893. It contains more than a ton of pure copper besides some silver and gold.

THE New York Academy of Sciences with the coöperation of the American Museum, the New York Botanical Garden, the scientific departments of Columbia University, New York University and other institutions, has begun a scientific study of the island of Porto Rico along the lines of geology, palæontology, zoölogy, botany, anthropology and oceanography. With the assistance of a friend the Academy has voted to expend \$1500 a year for five years on this work and the insular government of Porto Rico has made an appropriation of \$5000 for the fiscal year beginning July 1, 1914, with the expectation that this appropriation would be repeated on each of the ensuing four years. The committee having the work in charge consists of Professors N. L. Britton, James F. Kemp, Franz Boas, C. L. Poor and H. E. Crampton. Mr. Roy W. Miner of the Museum's department of invertebrate zoölogy and Mr. John T. Nichols of the Museum's department of ichthyology and herpetology will be among those who will carry on investigations in Porto Rico this summer.

On June 4 Mr. Paul J. Rainey, who has recently returned from a two years' residence in British East Africa, gave to the members

of the Museum the first exhibition of his latest motion pictures of African wild-animal life. Because of the popularity of the lecture the auditorium was not only filled at eight o'clock but there was also a large overflow of members waiting for admission. In order not to disappoint these, Mr. Rainey kindly consented to repeat his lecture later in the evening when more than eleven hundred were in attendance. To insure the preservation of the films as scientific records, Mr. Rainey has presented a set to the Museum.

IN the May number of *Petermann's Mitteilungen*, appears the first chart to be published of the Bay of Isles, South Georgia Island. The map and accompanying article are by Mr. Robert Cushman Murphy and represent a phase of the scientific work of the expedition to the Subantarctic Atlantic, conducted during 1912-13 by the American Museum of Natural History in conjunction with the Brooklyn Museum of Arts and Sciences. The chart is of further interest to friends of either institution because one of the great valley glaciers in the Bay of Isles has been named "Lucas Glacier" in honor of the Director of the American Museum and another glacier is labeled "Morris Glacier" for the late curator of natural science in the Brooklyn Museum. A third is called "Grace Glacier" for the cartographer's wife and the fourth and largest "Brunonia Glacier" for Brown University. "Point Bellinghausen" commemorating the Russian circumnavigator who made the survey of South Georgia in the year 1820, "Beckman Fiord," named for the Norwegian whaler, and "Cape Woodrow Wilson" are among other localities which have been added to the map of the island.

The Bay of Isles was discovered in 1775 by Captain James Cook. For more than a hundred years it has been a harbor of much importance to sealers and sea elephant hunters at South Georgia. Recently it has been visited by whalers and by the Swedish Antarctic expedition but no survey of its extensive fiords and numerous islets had been published until the present chart appeared.

THE department of geology and invertebrate palæontology will coöperate with the Oklahoma Geological Survey in sending a field party into the Arbuckle Mountains, Oklahoma, during July and August. Dr. Chester A. Reeds of the Museum will be in charge of the party.

Scientific Staff

DIRECTOR

FREDERIC A. LUCAS, Sc.D.

GEOLOGY AND INVERTEBRATE PALÆONTOLOGY

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CHESTER A. REEDS, Ph.D., Assistant Curator

MINERALOGY

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GEORGE F. KUNZ, Ph.D., Honorary Curator of Gems

INVERTEBRATE ZOÖLOGY

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CHARLES-EDWARD AMORY WINSLOW, M.S., Curator

ISRAEL J. KLIGLER, B.S., Assistant

WOODS AND FORESTRY

MARY CYNTHIA DICKERSON, B.S., Curator

BOOKS AND PUBLICATIONS

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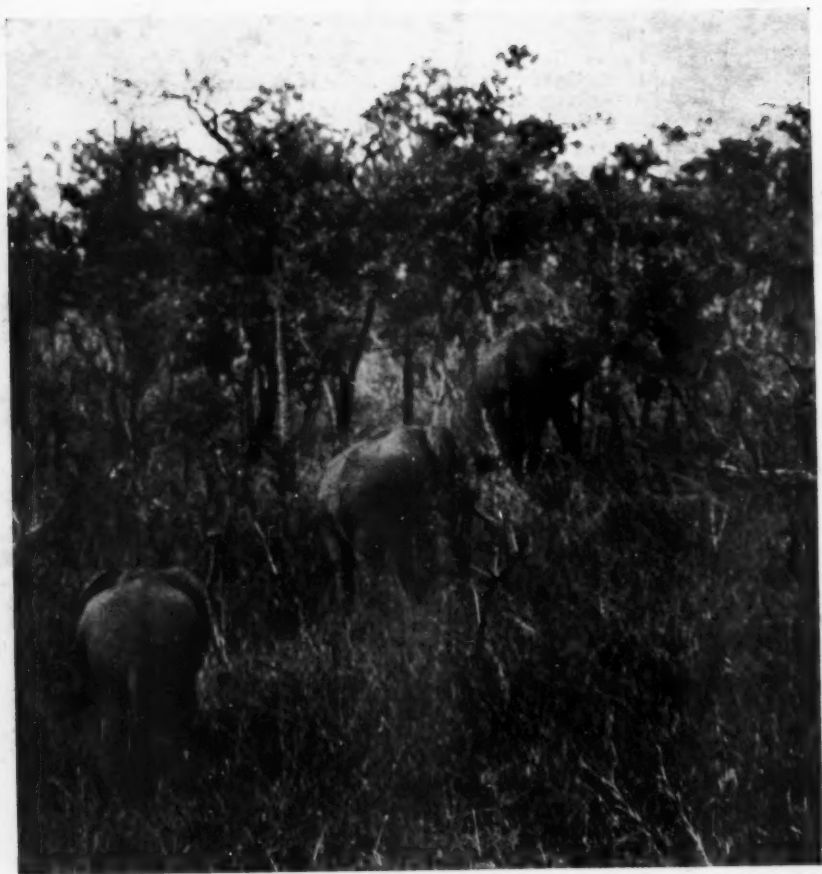
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G. CLYDE FISHER, Ph.D., Assistant Curator

AGNES LAIDLAW VAUGHAN, Assistant



In the African jungle